The Electrical Industry's Weekly Magazine

April 8, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication

GEDA

Computers Take Over

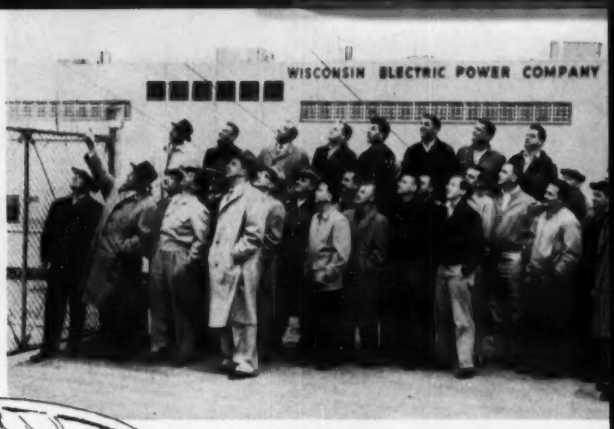
EARLY BIRD

System Dispatch ... Page 79

EGAD

Meet President Wolfe of Baltimore G&E ... Page 67

E B POWER
GS W 1
UNIVERSITY MICROFILMS I
313 N 1 ST
ANN ARBOR MICH

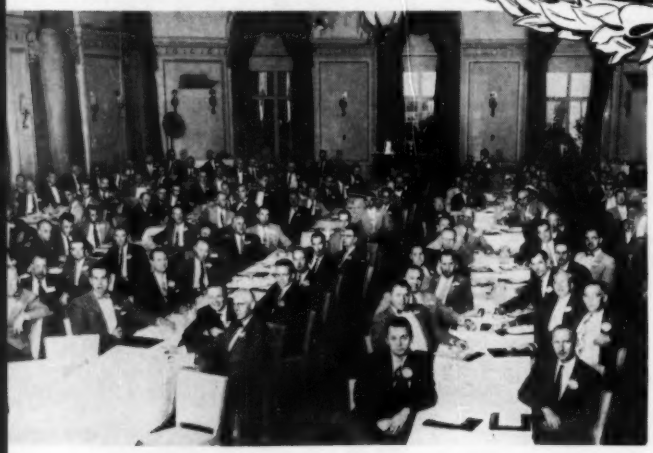


A staff of consultants performs a variety of practical services for W.E.P. Co. customers. This service even includes cooking specialists who design industrial cafeterias and suggest equipment.

Automation forum and other such activities that I.P.&L. consistently sponsors and promotes, assist their sales and engineering staff, alerting them to new developments and selling possibilities.

Good public relations is fostered by Wisconsin Electric Power Co. through tours of power stations. Industrial customers and the public are impressed by service provided by giant generating plants.

Training courses are one of Indianapolis Power & Light's many positive steps to increase efficiency of sales and engineering staff. Example: this course in Metal Sheath Electric Heating.



Wisconsin, Indiana utilities win 1956 More Power to America awards

Indianapolis Power & Light Company and Wisconsin Electric Power Company stress more personal contact, improved customer relations and service

The 1956 winners of the More Power to America Awards, as announced by Edison Electric Institute, effectively illustrate that fulfillment of industrial load growth forecasts is best accomplished by positive action.

In line with the MPA Award requirements, both these utilities made excellent use of industrial forums, training courses, and timely promotions, evidencing at the same time a keen interest in industrial and community affairs. In addition, they provided consulting services for their customers and contacted them regularly.

One of the greatest advantages to any utility, inherent in competing for the award, is the incentive for making a broad appraisal of achievements and potential, with an eye toward even greater improvements and efficiency in the future. Why not document your activities and plan to compete for an MPA Award in 1957? For full details contact the Edison Electric Institute or General Electric Company, the donor of the award. General Electric Company, Section 301-355, Schenectady 5, N.Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 147, No. 14 APRIL 8, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT EVENTS

PUC Disallows Central Maine Rate Boost

Commission rules against fast depreciation tax benefits for rate-making purposes, hits promotion spending.....p 65

Ted Wolfe Takes Over at Baltimore G&E

Newest utility president grew up in the business and hasn't let his new position spoil his golf game.....p 67

MANAGEMENT

'Natural Names' Help in Expense Control

West Penn Power gives accounts easily understood names instead of numbers and betters cost control..... p 74

DISTRIBUTION

Capacitors Stabilize 12-Kv Feeder Voltage

Swinging loads on rural feeders tamed. Method is economical where loads do not warrant heavier facilities.....p 76

Special Report

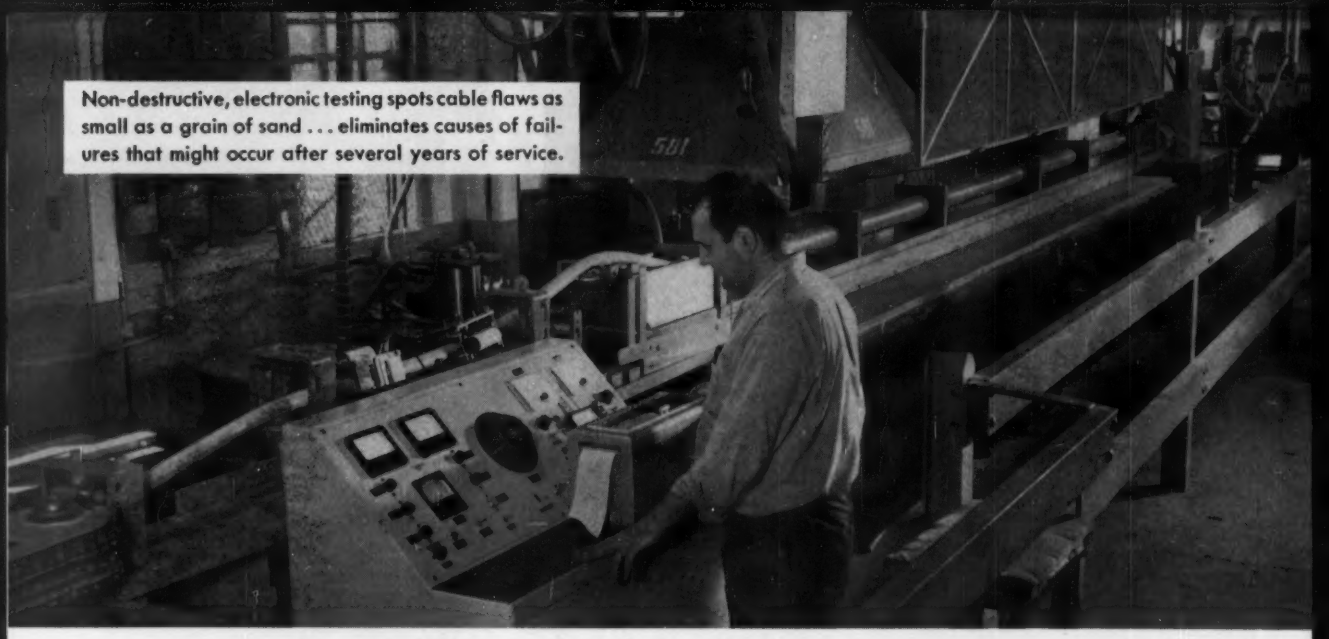
Computers Take Over System Dispatch

Automation reaches new heights in power generation field as computers dispatch energy with ultimate economy.....p 79

Departments

Atomic Progress 69
Books 134
Catalogs and Bulletins 132
Editorials 63
• Electrical Newsletter 19
Engineering Reference Sheet....102
From the Publisher 5
How To 94
• Management Newsletter 139
Manufacturers and Markets.....145
Meetings Calendar 156
Meeting Reports 72
New Equipment 119
News About People.....150
News-Beat 66
Selling 106
Washington Wire 70

INDEX TO ADVERTISERS.....159



Non-destructive, electronic testing spots cable flaws as small as a grain of sand . . . eliminates causes of failures that might occur after several years of service.

now all Okonite rubber strip-insulated cables rated above 2kv undergo the most searching test in the industry

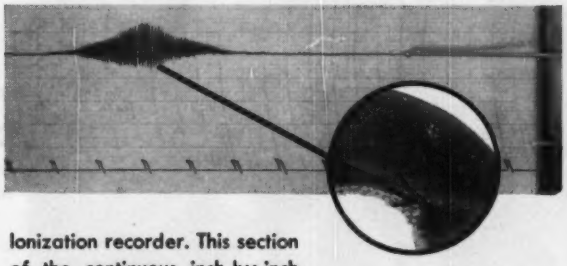
The Gooding Test Train, an Okonite development, can literally peer through every inch of solid dielectric cable to pinpoint flaws for removal or correction.

Two years' experience in regular production has proved that the Gooding Test Train detects flaws heretofore unrevealed even by the highest industry voltage tests or full-reel corona tests. Now that this valuable method of quality control has been thoroughly established, Okonite has extended its testing range to all strip-insulated cables rated above 2kv.

The entire cable passes through a series of three test units which provide unequalled assurance of successful service. The Gooding Test Train is used on strip-insulated cables in addition to Okonite's self-imposed, factory high-voltage acceptance tests which exceed industry specifications.

UNIFORMITY TEST—A uniformity gauge continuously checks insulation thickness to locate any thin spots.

IONIZATION TEST—The tiniest voids and imperfections are detected and located by measuring the corona level of the cable inch-by-inch. To pass, a cable must not show any trace of corona at a test voltage that is 1½ times the rated voltage of the cable. Defects that might escape any other known factory acceptance tests show up clearly on the associated ionization recorder. Defects of this kind can cause premature failure after only a few months' or years' service.



Ionization recorder. This section of the continuous inch-by-inch ionization test shows the recording of a defect in the insulation.

X-RAY TEST—A 250,000-volt X-ray machine can be used to study the nature and extent of any flaws located by the first two units.

For additional information about this revolutionary testing method, write for Bulletin EW-1100. The Okonite Company, Passaic, N. J.

4702

where there's electrical power... there's **OKONITE CABLE**

Electrical World Staff

Fischer Black Publisher and Editor

Daniel T Braymer Assistant to the Editor

Engineering

Leonard M Olmsted Managing Technical Editor
John J Kearney Assistant Managing Technical Editor
Howard S Knowlton New England Editor
Edward Allen Midwestern Editor
Francis J Kovalcik Western Editor
David Rea Southeastern Editor
James G Plunkett Northeastern Editor
Charles F Hochgesang Associate Editor
Archer E Knowlton Consulting Editor

News

Herbert R Frankel Managing News Editor
Jesse A Mock Assistant Managing News Editor
Rue M Shoop Associate Editor
Allen Long News Editor **Theodore W Fuller** and **Denise Hennessy** Editorial Assistants
Thomas R Jordan Commercial Editor
Kenneth N McLean Industrial Editor
George B Bryant, Jr Manager, Washington Bureau
V Craig Richter Washington Correspondent

Special Services

Arthur J Stegeman Manager, Market Research
Dexter M Keezer Director, Economics Department
Theodore C Boyden Economist

Production

Kenneth K Kost Manager of Production
George Swift Assistant Manager of Production
Frank C Stockman Art Director
H Tomlinson Howland, Jr Production Editor
Elaine Maguire Assistant Production Editor

Advertising

Warren W Shew Sales Manager
District Managers: N V Palmer and E S Chapin, New York; E S Chapin, Boston; F P Coyle, Philadelphia; M S Kearney, Cleveland; M I O'Connell, Detroit; W H Meneilley and J T Schaefer, Chicago; J T Schaefer, St. Louis; E E Schirmer, Los Angeles; R C Alcorn and T H Carmody, San Francisco; Robert H Powell, Atlanta; Gordon Jones, Dallas.
Otto A Drechsel Business Manager
Donald K Ellis Promotion Manager

•

E Bryson Sessions Circulation Manager

. . . *from the publisher*

Automation is nothing new to the electric power industry. Already it handles relaying and breaker operation, voltage regulation, and boiler combustion controls, to name a few things. Two weeks ago we carried a story on how Cleveland Electric Illuminating Co is automatically recording the pounds of coal burned per kwhr at one of its plants (March 25, p 94).

In this issue our editors come up with a 12-page special report on another, still bigger chore for automation: system operations (page 79). What is new here is not the computer, nor the idea of load control, but the coupling of one to the other so the machine does both the "thinking" and the "acting."

In the report you'll read how a computer takes control of Ohio Edison's 8,900-sq mi system. How another is expected to save up to $300,000 a year in steam generation costs for the Southern Co by making better use of water at hydro plants, eliminating loss of weekend storage, and cutting maintenance costs. How Public Service Co of Colorado puts it to work in five of its system operational functions.

Compiled by Chief Technical Editor Len Olmsted and his staff, it is "must" reading for management, production and planning engineers, load dispatchers, and system operators —in fact, every economy-minded utility man.

Fischer Black

ELECTRICAL WORLD

Published weekly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation, and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for directions regarding subscriptions or change of address.

Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. **Position and company connection must be indicated on subscription orders.** Send to address shown in box at right.

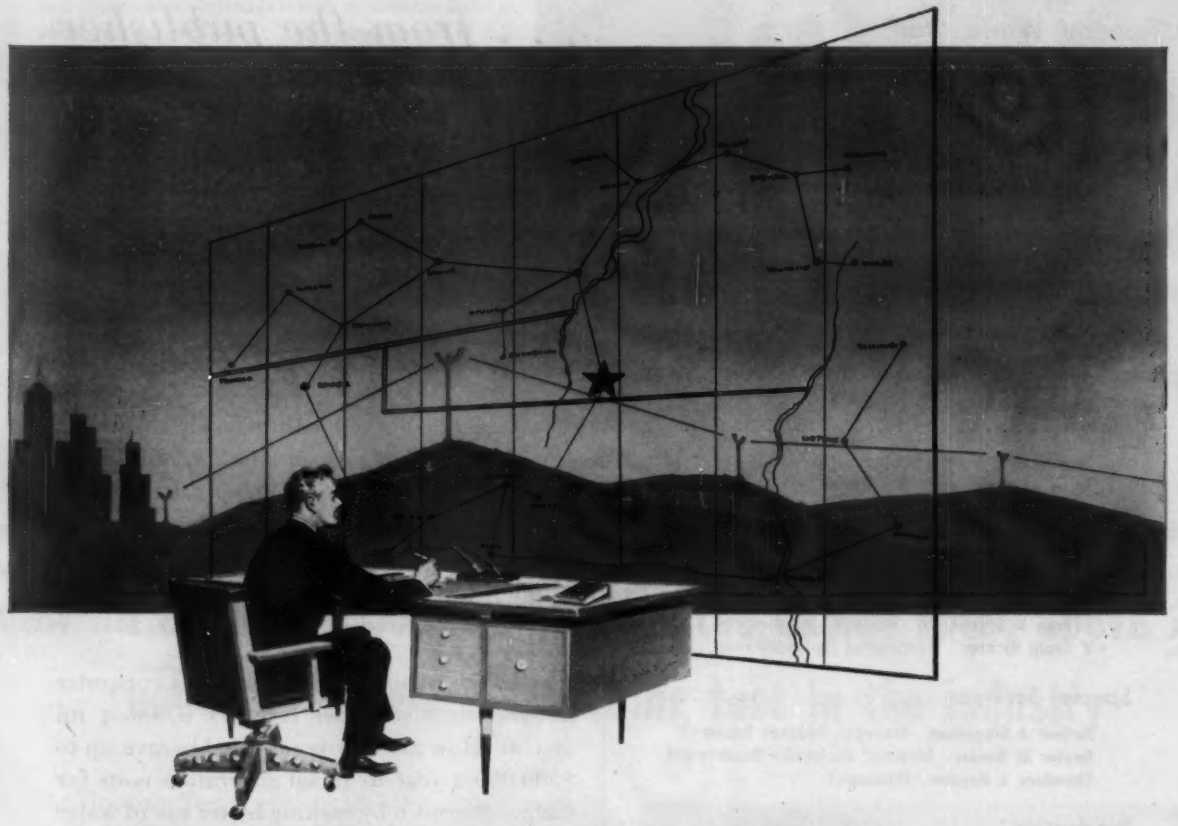
United States and Canada subscription rate for individuals in the field of the publication $6.00 per year, single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class mail privileges authorized at Albany, N. Y. Printed in U.S.A.

Title registered in U.S. Patent Office. ©Copyright 1957 McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

SUBSCRIPTIONS AND ADDRESS CHANGES: Send subscription correspondence and change of address to Subscription Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical World, 330 W 42nd St, New York 36, N. Y.



TEN MILES OR A THOUSAND . . .

Motorola Microwave puts complete operational control at your fingertips

Cross-country or cross-town—Motorola Microwave can give you centralized control in one *complete*, privately-owned communication system that spans city streets, rivers, and mountains with ease. Multiply your present communication facilities with this work-horse that provides multi-channel facilities for transmitting and receiving orders and instructions by voice, printed messages and control signals. It will speed a thousand tasks a day, working 'round the clock to give you better control, improved coordination and increased efficiency . . . all at a substantial savings in cost.

With Motorola Microwave serving all types of applications (many of them in your industry) you get the benefit of extensive experience. In installation after installation, operational records prove that Motorola Microwave performs better, lasts longer and costs less to maintain.

Learn how Motorola Microwave can give you the *complete* communication system for centralized control. Write, wire, or phone today.

VOICE

Private line and party line—manual and dial telephone circuits—VHF mobile and base station 2-way radio . . . *all* can be carried hundreds of miles, economically and privately, by Motorola Microwave.

PRINTED MESSAGES

Read a message, a chart or facsimile a thousand miles away in seconds. Assemble necessary information the fast, efficient way. Teleprinting, telemetering, telegraph, facsimile are at your command with Microwave.

CONTROL SIGNALS

Read meters, turn valves, from *any* central location you want. With Motorola Microwave you can have supervisory control, remote control, and remote indication. Greater efficiency at less cost.

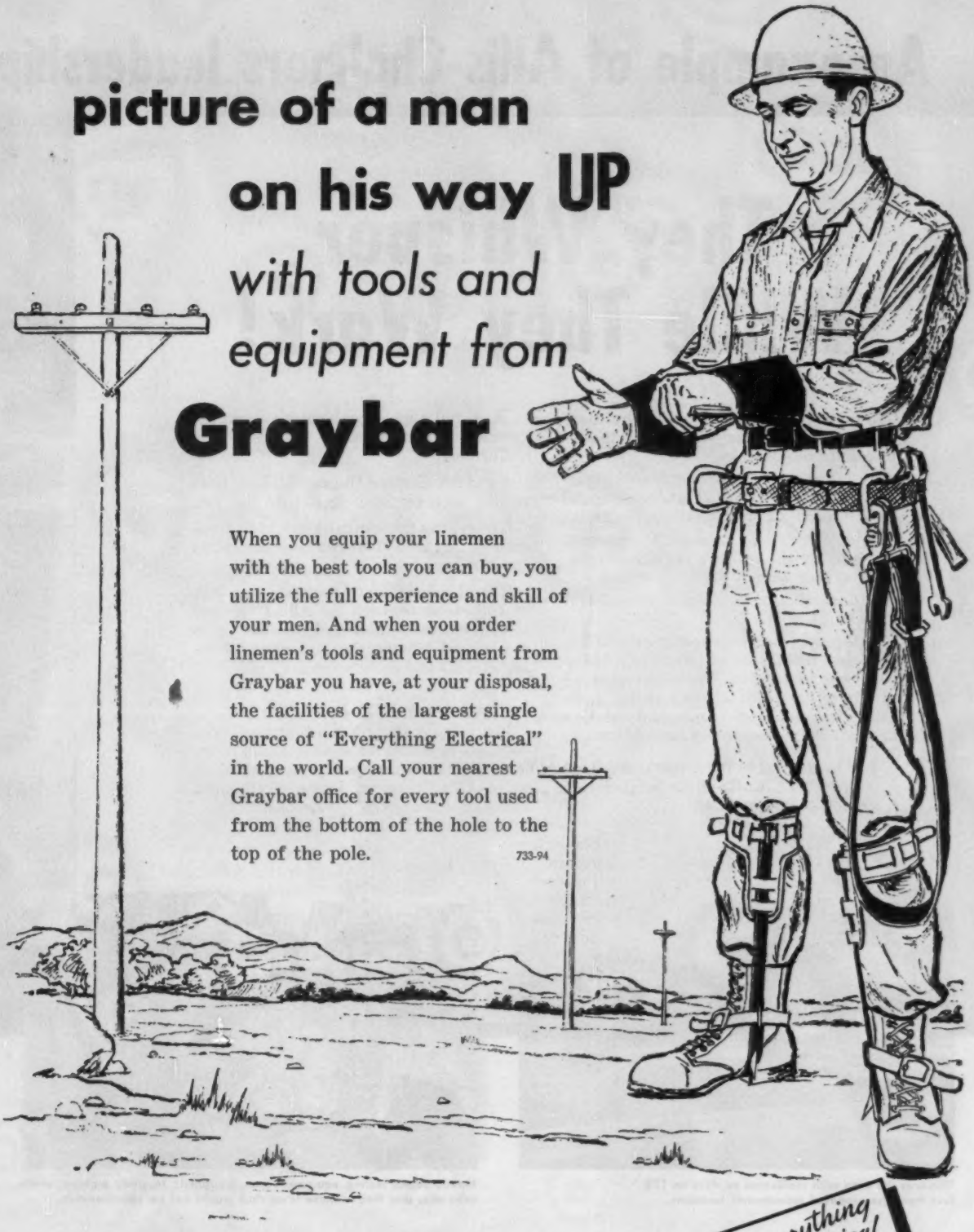
MOTOROLA MICROWAVE

Motorola Communications & Electronics, Inc., 1400 N. Cicero Ave., Chicago 51, Ill., A subsidiary of Motorola, Inc.

picture of a man on his way UP

with tools and equipment from

Graybar



When you equip your linemen with the best tools you can buy, you utilize the full experience and skill of your men. And when you order linemen's tools and equipment from Graybar you have, at your disposal, the facilities of the largest single source of "Everything Electrical" in the world. Call your nearest Graybar office for every tool used from the bottom of the hole to the top of the pole. 733-94

Call Graybar first for...

Everything Electrical — GraybaR ELECTRIC COMPANY

GRAYBAR ELECTRIC COMPANY, INC.
420 Lexington Avenue, New York 17, N. Y.

IN OVER 130 PRINCIPAL CITIES

An example of Allis-Chalmers leadership

They Whisper While They Work!

These two 100,000-kva Allis-Chalmers transformers are good neighbors... thanks to careful pre-planning.

Installed in the middle of a residential area, these two large transformers could have created a public relations headache.

They didn't . . . because of elaborate planning by the utility's engineers working together with A-C.

In fact, this installation is a model of what can be done.

Before any designing was started, Allis-Chalmers mobile sound laboratory equipment was brought in. Day and nighttime studies of ambient characteristics indicated that the most economical solution to the problem required a twofold attack.

1. Design and build a low noise level transformer unit with frequencies melded to the ambient.

2. Build a masonry barrier around the transformers to reduce the noise level further.

So critical were the conditions that neither step by itself would do the job.

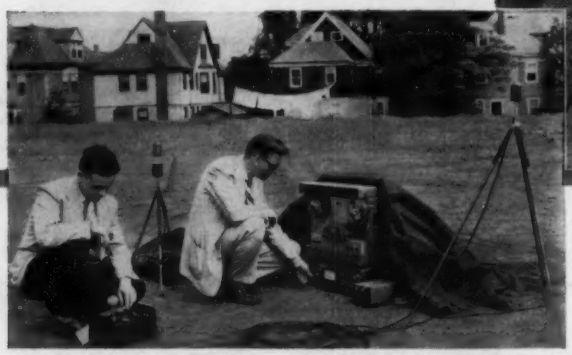
Today, the transformers are in full operation . . . and there are no complaints from the neighbors.

Transformers like this are an outgrowth of continued research by Allis-Chalmers into magnetostriction and resonance in A-C sound laboratories, acoustical proving ground and mobile research unit.

* * *

For help in finding the best and most economical means for solving sound problems, contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

This was the area with residences as close as 170 feet from the proposed transformer locations.



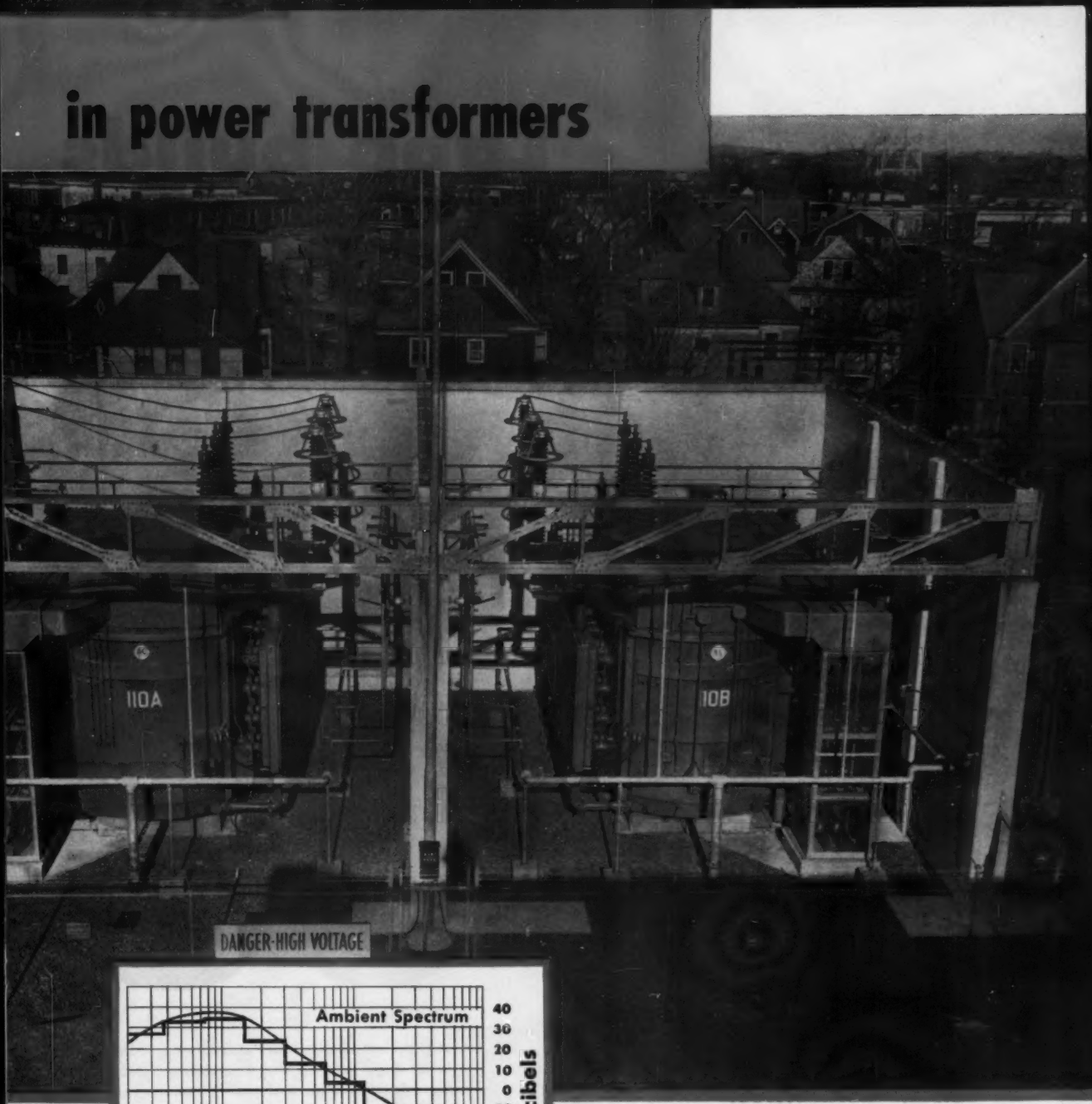
Mobile sound testing equipment was brought in to study ambient characteristics and find a noise level that would not be objectionable.

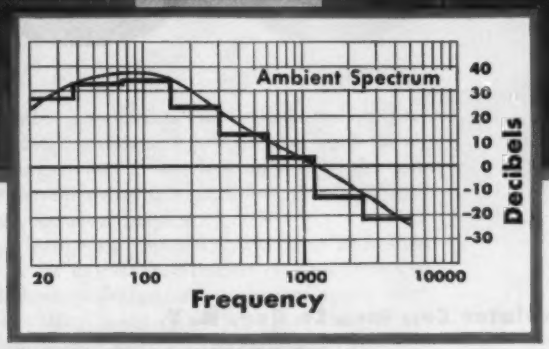
A-C ALLIS-CHALMERS

ALLIS-

A-5353

in power transformers



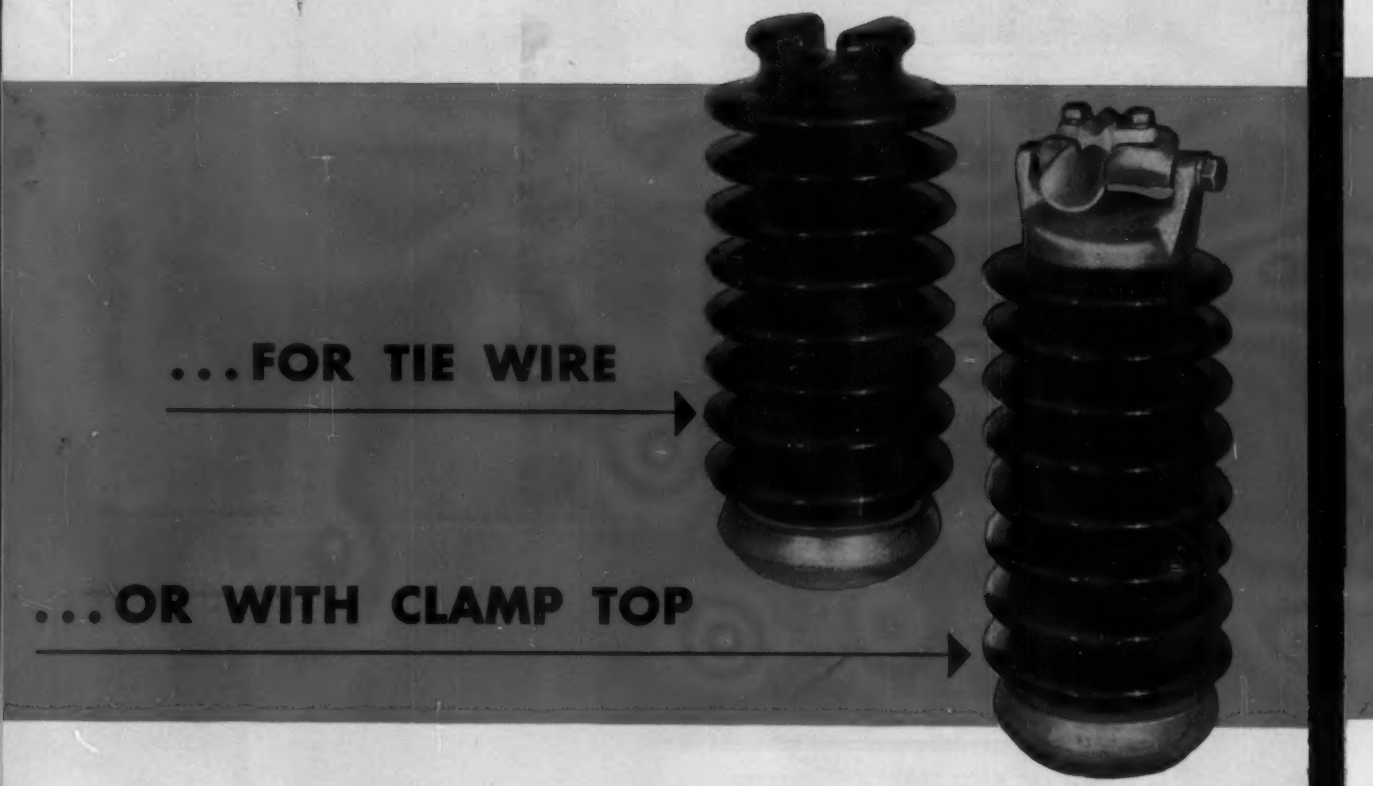


On-the-site testing in quiet predawn hours determined minimum masking noises.

Transformer noise level lower than standard and use of masonry barriers were dictated by the severe requirements of the neighborhood.

CHALMERS

Lapp builds the Line Post

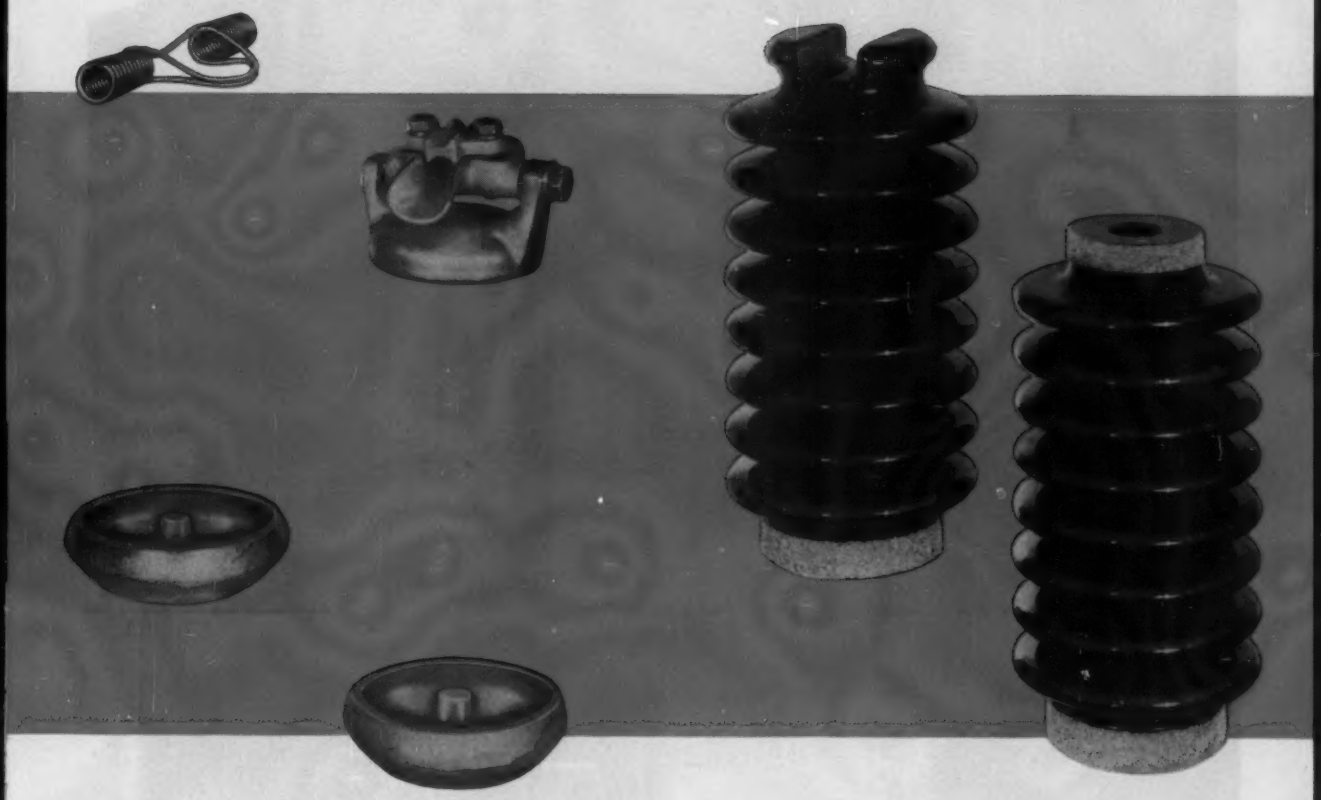


Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

This is the hardware

This is the insulator



For tie-wire installation, the Lapp Line Post provides a deep, square-side top groove. Such an installation provides a "mechanical fuse"—the conductor can slip through to relieve structure load in case conductor breaks.

With clamp-top assembly, the Lapp Line Post provides for easiest installation or change-out of any clamp-top design. A single cap screw with captive washer is the only loose part throughout installation. For change-out, the clamp stays on the conductor. All clamps are interchangeable on all sizes of Lapp Line Posts

In either type of assembly, the tie-wire, the base or the clamp top are mechanical parts. Their function is only to attach the conductor to the insulator and the insulator to cross arm or pole—and to provide such attachment in a way that will permit the insulator to do its job faithfully.

With either tie-wire or clamp-top construction, the *insulator* is the porcelain post. It is a closed-end post of Lapp electrical porcelain of fog-type design. Its uniform long leakage path prevents leakage flashover in contaminated atmosphere. It has exceptional stamina under arcover and attack by stones and bullets because short, strong petticoats protect its sturdy body. It won't puncture because it has no conductive material within it. It won't crack, because its hardware . . . top and bottom . . . is *externally* attached, and can load the porcelain only in compression.

The Lapp Line Post will improve your service record and your maintenance record by providing an *extra* margin of operating security, low upkeep and long life.

"Each and every component good as new ... after four years' continuous service,"

reports Pennsylvania Electric Company

"After four years' service—and more than double the operations of a normal between-inspections period—every component was like new in this Westinghouse URS regulator," states Mr. Frank Bartlett, Jr., maintenance foreman of Pennsylvania Electric Company.

Experiences like this back up 20-year contact-life warranty on URS regulators

"When we opened this Westinghouse URS voltage regulator after four years' continuous service, we found each and every component as good as new," states the maintenance foreman at Pennsylvania Electric's Sayre-Waverly Substation. "Contacts still in perfect operating condition.

"With as many as 100 operations per day," he continues, "this equipment delivered continuous trouble-free service. The Westinghouse URS regulator eliminated the constant adjustments, necessary to prevent drifting, which were required for the regulators we formerly used. Maintenance is extremely low."

He adds, "Complete dependability under constant service, long, trouble-free life, ease of adjustment, and stability in delivering constant voltage make the URS regulator a major factor in guaranteeing customer satisfaction.

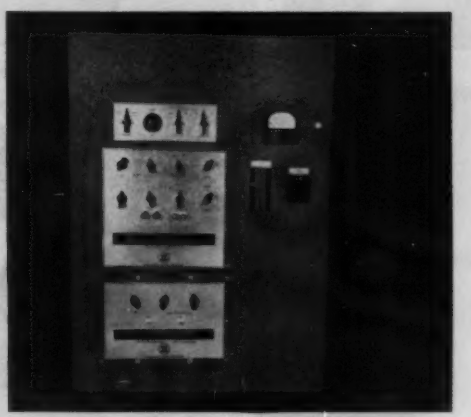
"The 'inside story' revealed when we inspected the unit, gives us complete confidence that this regulator will perform its exacting job . . . for a long time to come."

And now . . . a new concept in precise voltage regulation . . . the URS regulator is equipped with Magamp® (magnetic amplifier) control. Standard for URS and URT load tap-changing equipment for both station step regulators and power transformers. Magamp has no moving parts, no need for mechanical adjustments, no maintenance. All settings—band width, balance voltage, line-drop compensation—are made electrically. This is one of the features assuring still longer life of URS regulators, better voltage regulation.

For all the facts concerning URS voltage regulators, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70807

YOU CAN BE SURE... IF IT'S Westinghouse

In this recent announcement, Westinghouse offers a 20-year prorated warranty on contact life for URS regulators with inspection of contacts extended to 10-year intervals.



Behind this control panel are the economy of maintenance-free Magamp and the unmatched speed and smoothness of Geneva gear tap changing—exclusive with URS and URT voltage regulators.

What's *New* about this Guy?

The big new facts about Copperweld* Type M Guy Strand are its economy and its convenience.

Copperweld always has cost less per year of service. Now, this low annual cost is still lower, because prices of every size of the new Type M Guy Strand are lower.

Two Copperweld achievements make this possible:

- First, a special new guy strand developed through Copperweld research enables us to meet tensile strength specifications with smaller diameters.
- Second, new guy strand production techniques appreciably reduce the cost of manufacture.

The new Type M Guy Strand is pliable—easy to handle. It can be readily bent, served, moused or clamped. The time-proved Copperweld process, by which the thick copper sheath of each wire is inseparably molten-welded to the steel core, gives full assurance that the copper will not crack, flake or peel.

Copperweld Type M Guy Strand is available in 5 strengths: 3-wire strand in strengths of 2.2M and 4M; 7-wire strand in strengths of 6M, 10M and 16M—and sold in coils of 250, 500 and 1,000 feet. Our field engineers will be glad to tell you about the new economies you can realize through its use.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

*Trade Mark

ANOTHER REASON WHY UTILITIES EXPECT MORE FROM

POWERS *American*

Setting the pace...

Pole-Master®

HYDRAULIC DERRICKS

3 MODELS...7 SIZES

You just can't beat the cost-cutting convenience of Pole-Master. At the flick of a lever, powerful hydraulic cylinders move the derrick to the position that's *exactly* right for the hoisting job. There's no exposed mechanism. Head sheave can be threaded from the ground.

When it comes to capacity, Pole-Master equals or surpasses conventional derricks of comparable rating. It stows *above* the body... never obstructs valuable cargo area space.

Aren't these the features you've long wanted in a derrick for your job?

The powerful Series PM-2 Pole-Master, shown above on a Powers-American Series 800-C Line Body, is available in sizes for handling 40′, 55′, and 70′ poles.

DESCRIPTIVE LITERATURE ...plus complete price information IS YOURS FOR THE ASKING!

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO.

625 CEDAR ST. • BERKELEY 10, CALIF.

Series HD-2 Pole-Master Derricks can be furnished in sizes for handling 40′ and 55′ poles.

The Series HD-4 Pole-Master, actuated by four hydraulic cylinders, handles 55′ and 70′ poles.

Powers-American conventional derricks, tripod or T-type, are available in all sizes and capacities.

A fact for every electric utility

FROM COLD RESERVE TO FULL LOAD IN 60 SECONDS

Impossible? Not at all. For this is a characteristic of Electro-Mobile Power. From a cold start a 1000 kw unit can deliver its full load *in less than sixty seconds.*

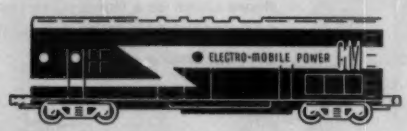
This is true of one or one-hundred units, 1000 kw or 100,000 kw—steady full-load power in far less time than required by any other prime mover, except a spinning unit.

But spinning reserve is *costly* reserve. By letting Electro-Mobile Power supply reserve requirements you not only eliminate running losses, but investment per kilowatt is lower. Efficiency of present stations will improve, too, because generators can be run at a higher load factor.

Further, by placing Electro-Mobile Power at the points of load, transmission loss is reduced and less reserve is required to maintain service. Another advantage: EMP units are available with impulse starting or stopping which permits unattended operation from any location.

How might a multi-megawatt system of Electro-Mobile Power units apply to your system? We'd like an opportunity to sit down with your engineers and discuss it. Contact your Electro-Motive representative, he has the details.

Increased demand of 5000 kw at central station picked up in less than 60 seconds by four 1000 kw Electro-Mobile units.



RAIL CAR—1000 kw units for use on sidings or placed on piers for semi-permanent use.

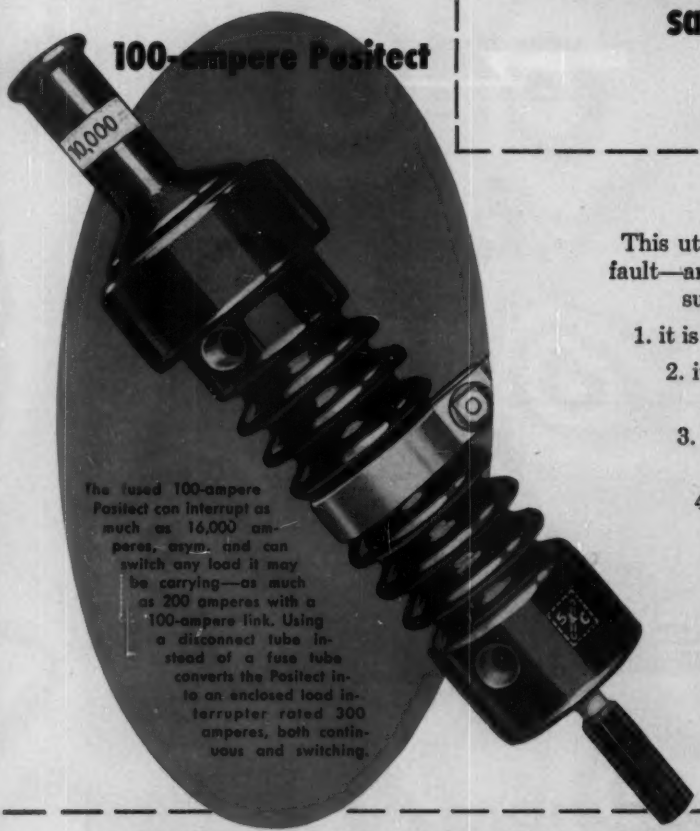
TRUCK TRAILER—500 kw units offer excellent mobility for many temporary applications.

This simple diagram suggests how Electro-Mobile Power located at points of load can effectively reduce reserve requirements and costs. Assuming a 1000 kw line loss at time of peak from the central station, only four 1000 kw EMP units are needed to pick up a 5000 kw demand. Naturally, line loss will vary according to the make-up of the system. However, an analysis of your peak line losses will show what savings can be expected.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS LA GRANGE, ILLINOIS
Sales Offices in Chicago, New York, St. Louis, San Francisco

question: why should this man wear safety glasses while using a Positect?

answer: the safety practices of this utility require safety glasses for all cutouts, even the Positect!



100-ampere Positect

The fused 100-ampere Positect can interrupt as much as 16,000 amperes, asym. and can switch any load it may be carrying—as much as 200 amperes with a 100-ampere link. Using a disconnect tube instead of a fuse tube converts the Positect into an enclosed load interrupter rated 300 amperes, both continuous and switching.

This utility knows that the lineman might close on a fault—and it uses safety glasses to protect him against such an eventuality. It uses the Positect because:

1. it is the only cutout which can be closed on a fault;
2. it directs the blast away from the operator—he is out of reach of the arc, flame, and shrapnel;
3. it minimizes the blast—by an exclusive feature which shortens the arc length;
4. the high inertia characteristic of its bayonet action opposes the recoil forces.

The long and short of it is this: it takes sound operating practices *and* good equipment to safeguard your linemen.

LIVE BETTER ELECTRICALLY

Specialists in High-Voltage Circuit Interruption Since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS • U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

S&C

NEWS-SCOPE

FUTURE NEWS ▶ **More nuclear power plant announcements are on the way.** Two electric groups in the South are putting final touches on their preliminary plans. They're both looking at plant designs and planning announcements within a very few weeks.

"Adventures in Utility Engineering," a booklet designed to help attract technical men to the industry, will be off the presses at New York State Electric & Gas Corp within the month.

U. S. Chamber of Commerce Board may come out soon in favor of a federally backed power reactor program.

LATE NEWS ▶ **Utility damage caused by the tornado** which hit Oklahoma and north Texas last week was confined mostly to lines and poles. Dallas Power & Light Vice Pres L. J. Blaize estimated 150 poles were down and 550 damaged. "Damage was substantial in the path of the tornado," he said. Other utilities in the area reported damages as negligible.

Supreme Court upholds Idaho Power Co's right to develop Hells Canyon site on Snake River by refusing to grant a National Hells Canyon Assn petition for review of Interior Department's license to the utility. Idaho Power Pres T. E. Roach calls decision a "triumph for the orderly processes of government."

Strike of operating workers is averted at Boston Edison as company and union officials sign two-year pact for wage boost and certain fringe benefits.

At EEI Sales Conference: EEI President Donald S. Kennedy and EEI Managing Director Edwin Vennard see bright future for power sales but again warn against dangers of government encroachment . . . E. J. Klock, General Electric, indicates that electric power must move in to fill the gap between production requirements and available manpower during the next 20 years.

At Southeastern Electric Exchange meeting: A. C. Monteith, Westinghouse, predicts industrial power sales of 450 billion kwhr and residential sales of 271 billion kwhr for 1963. That's 12½ and 15% respectively higher than estimate made in 1954. This would bring 1963 predicted sales to 1.03 trillion kwhr . . . Glenn B. Warren, General Electric, said savings to both users and suppliers would result from a more regular pattern of purchasing steam turbine generators, noting the irregular ordering periods. He produced charts which indicated average size of units in 1976 will be 450 Mw compared with 120 Mw this year.

A $16-million order for seven 107-Mva, 90-rpm, umbrella-type water wheel generators and associated voltage regulators for the Rocky Reach projects on the Columbia River goes to Westinghouse Electric Corp.

Manufacturers' acquisitions: Olin Mathieson Chemical Corp buys Southern Electrical Corp of Chattanooga, Tenn. . . . Rome Cable Corp has completed negotiations for purchase of T. J. Cope, Inc, Collegeville, Pa., makers of cable-pulling devices, tools, and equipment for installation of underground systems . . . McGraw-Edison Co acquires Griswold Mfg Co, makers of commercial electrical cooking equipment. This makes McGraw-Edison one of the largest manufacturers of food processing equipment in the country.

Congratulations . . . New president of Babcock & Wilcox Co is M. Nielsen, former executive vice president. He succeeds Alfred Iddles who is retiring.

ENGINEERING TRENDS

Multiple reheat with moderate initial temperature but very high pressure may change the steam cycle of future power plant designs, according to a paper at the recent American Power Conference. Very high second-reheat steam temperatures are also under investigation, drawing on gas turbine design practices for the re-vamped steam cycle.

Fluctuating steam and electrical loads in an industrial plant will almost always result in condensing generation concurrent with non-condensing or in non-condensing generation concurrent with throttling of high-pressure reducing valves. In operation of such a plant, a Btu in electric power is worth 4 times as much as a Btu in exhaust steam.

Capital cost of nuclear power plants may be cut by using water in the reactor container to absorb the thermal energy release in case of an incident and thereby limit pressure rise in the vessel, according to Alf Kolflat and W. C. Chittenden at the American Power Conference.

Most economic steam conditions will be 3,500 psi and 1,050F for the near future, according to R. D. Wilson at the American Power Conference. Advances to higher temperatures and pressures will depend almost entirely upon the development of better high-temperature alloys.

Paralleled turbines should be loaded at selected valve points to maximize power output per lb of steam rather than at equal incremental steam rate loadings based upon smooth average curves, advised A. D. Brookes at the same meeting.

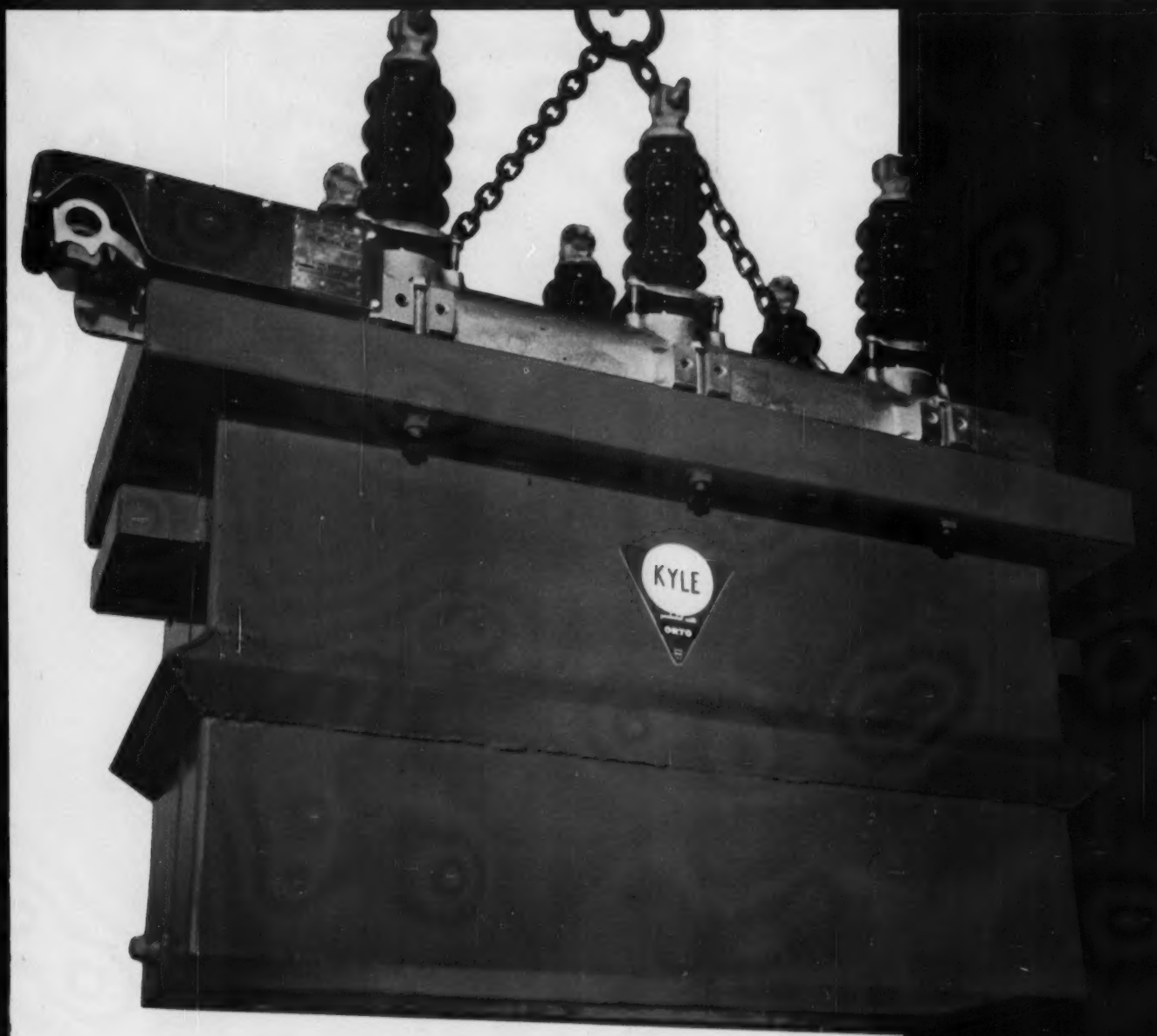
"Shot cleaning" of heat-absorbing surfaces in boilers is in experimental use by several U. S. utilities. The method depends upon the force produced by falling ¼-in. iron shot to remove deposits from either vertical or horizontal surfaces. It is extensively used in Europe.

Neutron absorption of light water requires fuel enrichment when light water is used as the coolant in reactors. Heavy water avoids this disadvantage but is expensive.

FROM EDITORS IN THE FIELD

The capability of many hydro plants can be boosted by modifying their turbines to take advantage of changed river conditions.

Tubular steel "H" structures support a 230-kv river crossing in Georgia. These structures, each having a 40-ft fabricated steel crossarm shackled near the tops of two poles, support the six 397.5 MCM conductors of two circuits. Poles are each made of a 35-ft section bolted to a 45-ft section with guys in four directions to take up the tension.



New! **200 MVA interrupting rating for $2,478**

Fast 2-Cycle Type W Recloser For Substation Application

L-M's new heavy-duty Type W recloser offers the greatest advance in system protection in the past 20 years—*high-speed, 2-cycle clearing of substation feeder circuits.* Advantages include closer coordination with fuses, larger substation transformer capacity without increasing wire size of the circuits, and minimum conductor burndown and outages due to non-persistent causes.

The Type W recloser also offers large savings in initial investment and maintenance, and it costs less than half as much as a circuit breaker used as the feeder disconnecting device in substations.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Here's How

L-M's Fast 2-Cycle 200 MVA Recloser Provides Greater Service Continuity

- **minimizes conductor damage and burndown**
- **offers closer fuse coordination, cuts fuse outages**
- **permits increasing substation capacity**
- **cost is approximately half that of OCB's**

By **FRANK McSTAY**, Product Manager, Kyle Products, Line Material Industries

Now for the first time, here is economical substation equipment that will operate fast enough to prevent conductor burndown resulting from transient or non-persistent causes.

Fast 2-Cycle Clearing

The high-speed, 2-cycle clearing of L-M's 200 MVA Type W recloser is approximately four times as fast as the total clearing time of most modern distribution oil circuit breakers. Up to 90% of transient faults can be cleared with no significant damage to the conductor or interruption of service continuity.

High-speed clearing also provides better fuse coordination, and trouble is confined to smaller areas.

360% Greater Conductor Protection

The importance of providing fast clearing time increases with the fault current. For example, consider a No. 1/0 standard conductor and a total clearing time of 12 cycles (standard for 8-cycle OCB's plus relays), compared with 2 cycles for L-M's high-speed Type W recloser.

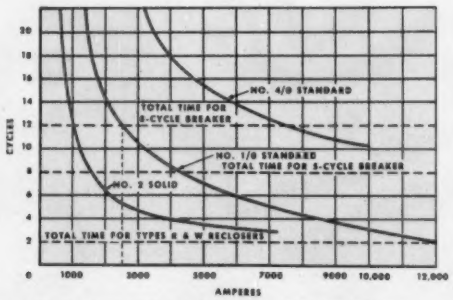


Chart shows average primary line burndown characteristics for standard weatherproof conductor. It also gives maximum clearing time for L-M's high-speed Type W recloser and minimum clearing time for the average oil circuit breaker plus relay time, showing the far greater protection against burndown provided by the Type W.

As the chart shows, with a 12-cycle OCB a No. 1/0 conductor will burn down at approximately 2,600 amperes. But with the 2-cycle Type W recloser, this conductor can take up to 12,000 amperes. L-M's Type W recloser would therefore protect the No. 1/0 conductor for approximately 360% of the maximum fault current for which the breaker would offer protection.

380% Greater Substation Capacity

Reducing the duration of fault-current flow with L-M's Type W recloser offers the opportunity to increase transformer capacity without increasing the wire size of the system or necessitating reactors to limit the available fault current.

If we again compare the burndown characteristics of a No. 1/0 conductor for a standard 8-cycle OCB and L-M's Type W on the chart, you will recall they protect the No. 1/0 conductor up to fault currents of 2,600 amperes and 12,000 amperes respectively. This means that if we assume an infinite primary bus, and the same percent transformer impedance, the transformer KVA at the substation can be increased 380% using the Type W recloser, without losing burndown protection for the No. 1/0 conductor.

Equivalent protection with reactors would require a capital investment estimated at $7,000 to $8,000, plus additional maintenance and substation space. Reactors would also introduce additional losses.

Fast Reclosing

L-M's Type W recloser has fast (25-cycle) reclosing to provide protection against rapidly recurring faults such as multiple strokes of lightning. This is accomplished on the Type W without derating the unit.

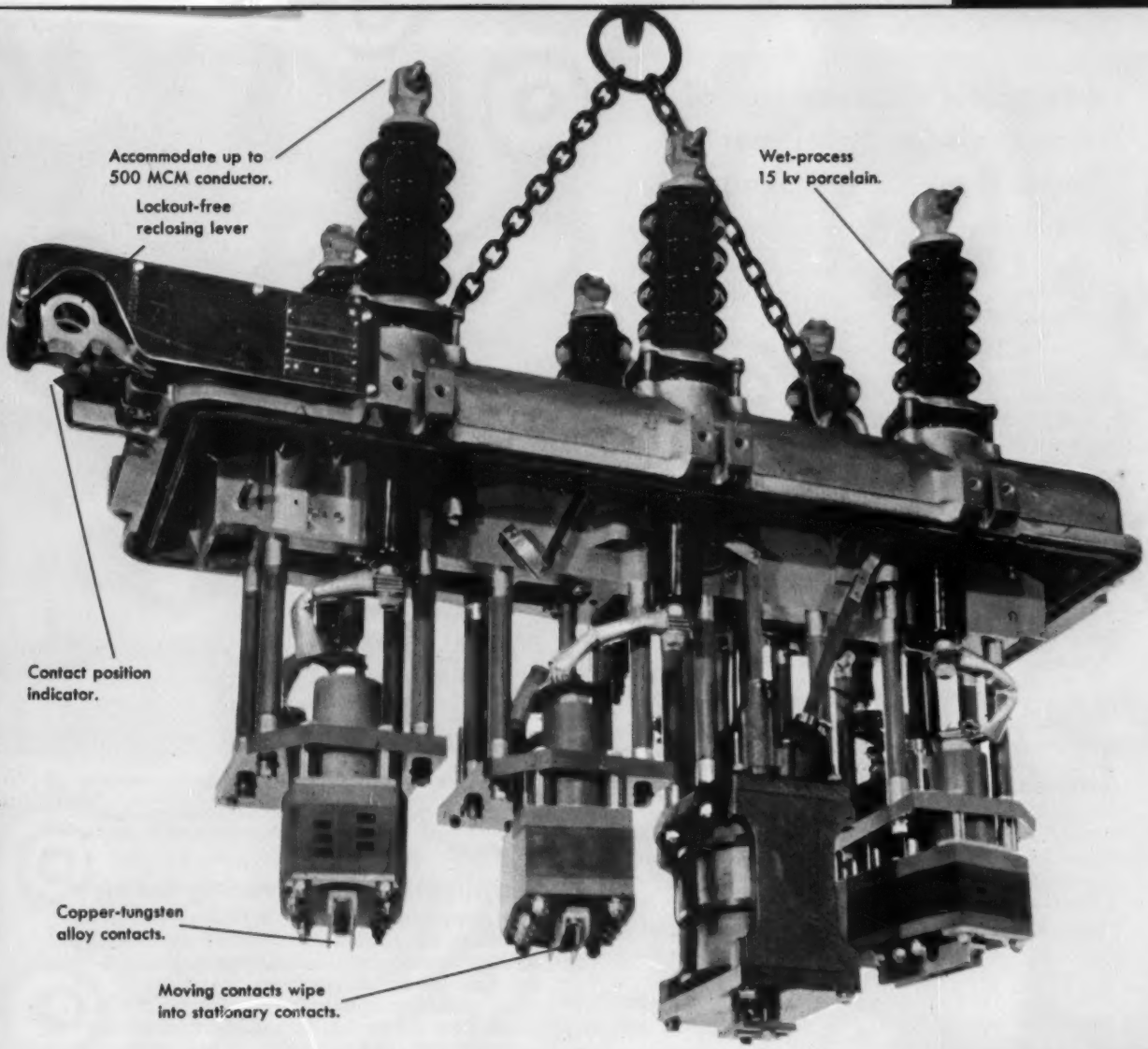
200 MVA Recloser for $2,478

The Type W is a 3-phase recloser, completely automatic and self-contained. Series over-current tripping is available with a selection of three time-current characteristics—fast, retarded, and extra retarded.

The initial investment in L-M's Type W recloser equipment compares most favorably with both the 100 MVA OCB for applications at low voltages and 250 MVA OCB at 14.4 kv, 110 kv BIL. The $2,478 price of the basic unit is about half as much as that of the OCB.

In addition, field reports indicate that the labor cost of installing the new high-speed Type W recloser is about half that of oil circuit breakers. And the maintenance cost for reclosers is also lower than for oil circuit breakers.

LINE MATERIAL
McGRAW-EDISON COMPANY


Accommodate up to 500 MCM conductor.
Lockout-free reclosing lever
Wet-process 15 kv porcelain.
Contact position indicator.
Copper-tungsten alloy contacts.
Moving contacts wipe into stationary contacts.

Time-current characteristics and operating sequences can be easily adjusted in the field.

Moving contact speed during separation is varied hydraulically so the contacts pause in the opening operation to permit arc extinction. This eliminates arc elongation and excessive interrupter erosion.

Contacts and arc interrupter structure utilize the snap toggle contact action and cross-blast arc extinction principle.

Sequences can be easily adjusted for 2, 3, or 4 operations to lockout in any combination of operations.

L-M's Kyle Type W, Heavy-Duty, 3-Phase Recloser
14.4 KV, 110 KV BIL,
560 Amp. Max. Load Rating.
Fast 2-Cycle Clearing Time.

New Type W Recloser Is a Power Class III Unit

(Proposed NEMA Standard)

Heavy Duty Cycle Rating	
No. of Operations	Percent of Inter. Rating
24	15-20%
16	45-55
12	90-100
52	15-100%

Load Ratings Amperes	High Interrupting Rating* Symmetrical RMS Amperes at Maximum Phase-to-Phase Nominal Voltage of:		
	2.4 to 4.8 kv	4.8 to 8.32 kv	8.32 to 14.4 kv
100	6000	6000	6000
140	8400	8400	8000
160	9600	9600	8000
185	11100	10000	8000
225	12000	10000	8000
280	12000	10000	8000
400†	12000	10000	8000
560†	12000	10000	8000

*For applications where X/R ratio does not exceed 14, 110 kv BIL.
†Available with minimum tripping current of both 160% and 200% of load rating.

Industries Kyle® Reclosers

McGRAW EDISON

L-M Offers Complete Line of Accessories to Supplement Series Over-Current Tripping

L-M's new Type W recloser provides accurate and dependable series over-current protection as a self-contained device. In addition, L-M offers a complete line of auxiliary equipment to provide almost any supplementary relaying scheme.

Ground Fault Relaying

L-M's new Type TW current transformer is used in conjunction with a ground trip solenoid to provide ground fault relaying, current metering, or both. The transformer consists of three single-phase units mounted in a single oil-filled tank. Ground fault relaying is accomplished by paralleling the TW secondaries of ground fault sensing. The unit can be mounted on the Type W recloser frame.

The Ground Trip Solenoid mechanism operates the recloser when it is energized by an unbalanced current from the paralleled secondaries of the current transformer. The solenoid mechanism provides its own dual time-current characteristics. The number of fast operations can vary from 0 to 4. The solenoid mechanism is mounted inside the recloser.

Other Relay Schemes

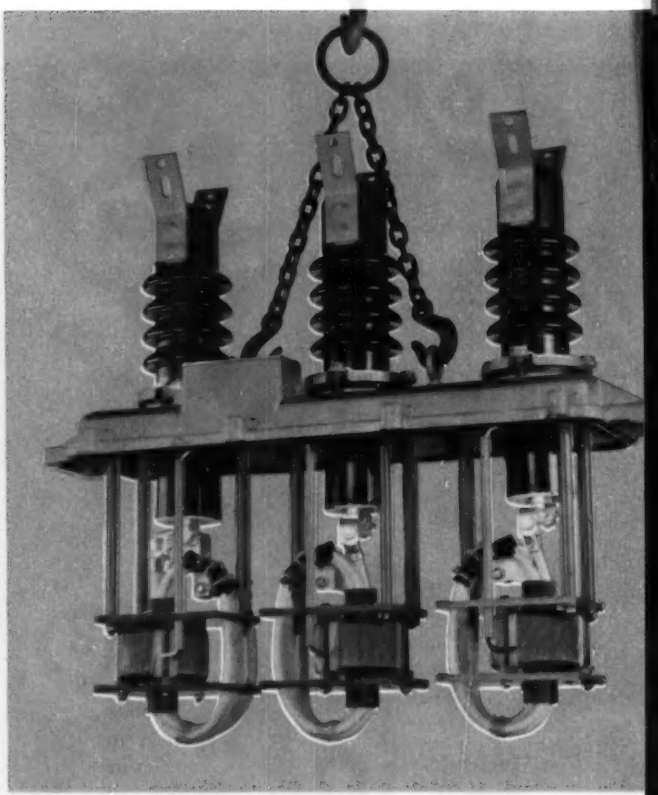
The Shunt Trip Solenoid mechanism is a tripping device only, designed to operate the recloser when energized from a supplementary relay scheme. When the solenoid is energized, the recloser starts operations to lockout just as in normal series tripping.

Shunt Lockout and Shunt Closing Solenoid mechanisms operate by remote control to trip the recloser and hold the contacts open to lockout and also to close the contacts by remote control.

Shunt Blocking mechanism is also available to prevent reclosing. The mechanism is controlled by a remote voltage source.

Auxiliary Switch provides positions for remote-control indication or low-voltage control switching of apparatus used in conjunction with the Type W recloser.

L-M engineers will help you design protective and switching schemes to best fit your system. In the photo are, left to right, Jay Wagner, Frank McStay, Wayne Wiechmann, and Lyle McNulty of Line Material working on a ground trip relaying scheme.



L-M's new 3-phase Type TW current transformer has a rated primary current of 400 amps., and insulation level of 14.4 kv, 110 kv BIL with current ratios of 600:5, 400:5 and 200:5. Primaries are connected one in each phase through coaxial bushings, and secondaries are in parallel.

Application Engineering Service

Line Material application engineers are experienced in the design and operation of protective and switching schemes for transmission and distributing systems. L-M engineers will cooperate with you in working out the most satisfactory schemes for your system. L-M will supply schematic circuit diagrams, time-current curves and control or switching schemes for any combination of current, voltage and time-delay relaying.

Get Complete Information

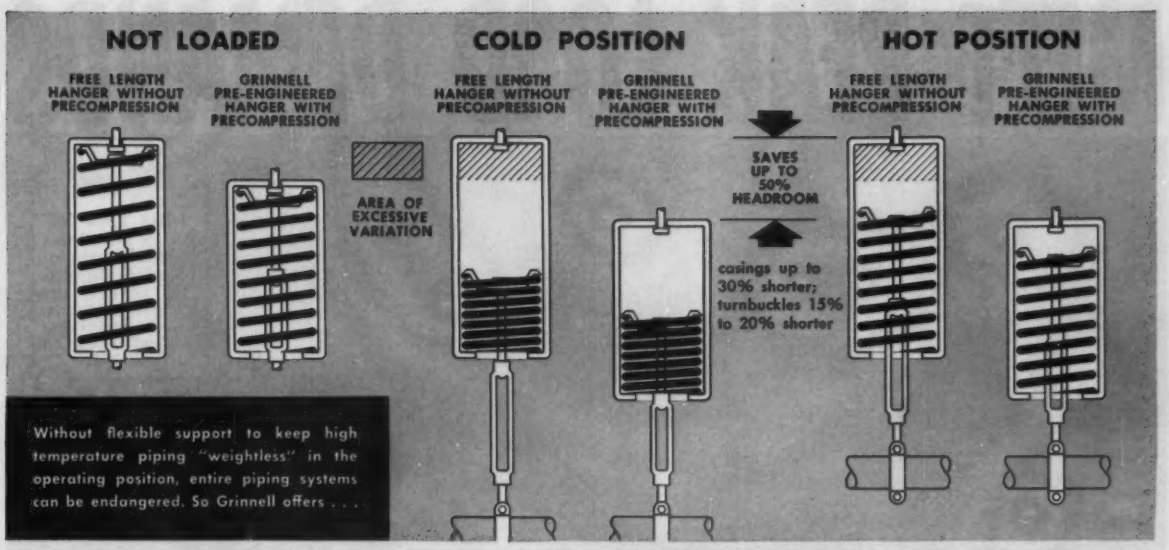
Ask the L-M Field Engineer for more information on how L-M's new Type W recloser can be profitably applied to your system. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

Kyle® Reclosers

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

McGRAW EDISON


NOT LOADED
COLD POSITION
HOT POSITION
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION
AREA OF EXCESSIVE VARIATION
SAVES UP TO 50% HEADROOM
casings up to 30% shorter; turnbuckles 15% to 20% shorter
Without flexible support to keep high temperature piping "weightless" in the operating position, entire piping systems can be endangered. So Grinnell offers . . .

Precompressed Hangers for Safer Support of Piping

Helical coil springs are widely used in hangers for flexible support of piping which moves up or down during thermal expansion. The A.S.A. code for pressure piping requires that variable spring hangers support at least a minimum of 75% of the pipe's weight for a pipe that rises (relaxing the spring) and no more than 125% of the pipe's weight for a pipe that lowers (compressing the spring) during operation.

Precompression patented Grinnell principle

To guard against the spring's supporting force exceeding the limits of variation, Grinnell developed and patented a variable spring hanger design. The steel casing holds the spring permanently precompressed, at the threshold of the hanger's working load range. This prevents the spring decompressing into its area of excessive variation.

Pre-set is not a substitute

As a partial substitute for this patented precompression, some manufacturers insert a spacer between the top end of a free-length hanger casing and the spring to hold the spring's height temporarily within the working range during shipment and erection.

Another device requires the manufacturer to drill symmetrically opposite holes in the casing walls and insert a bolt to hold the spring's height within the working range. When these devices are removed from the hanger and discarded, the spring can decompress, resulting in high variability in supporting force.

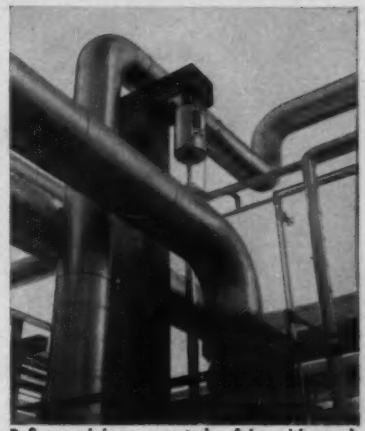
Cold-setting a universal factory service

For the erection crew to avoid having to compress the spring down to the erected position, the manufacturer can compress the spring down to this height. Grinnell can provide a cold-set bolt in precompressed hangers.

Less headroom required by Grinnell Hangers

Shorter hanger casings made possible by Grinnell's patented precompression, reduce bulk shipping weight and required headroom by eliminating undesirable height. Installation is simplified by this shorter casing and also by an integral load scale with load indicator.

Additional headroom is saved by a correspondingly shorter turnbuckle. These precompression advantages are available in short spring and double spring models as well as standard spring models.



Refinery piping supported safely, with ample flexibility but low headroom.

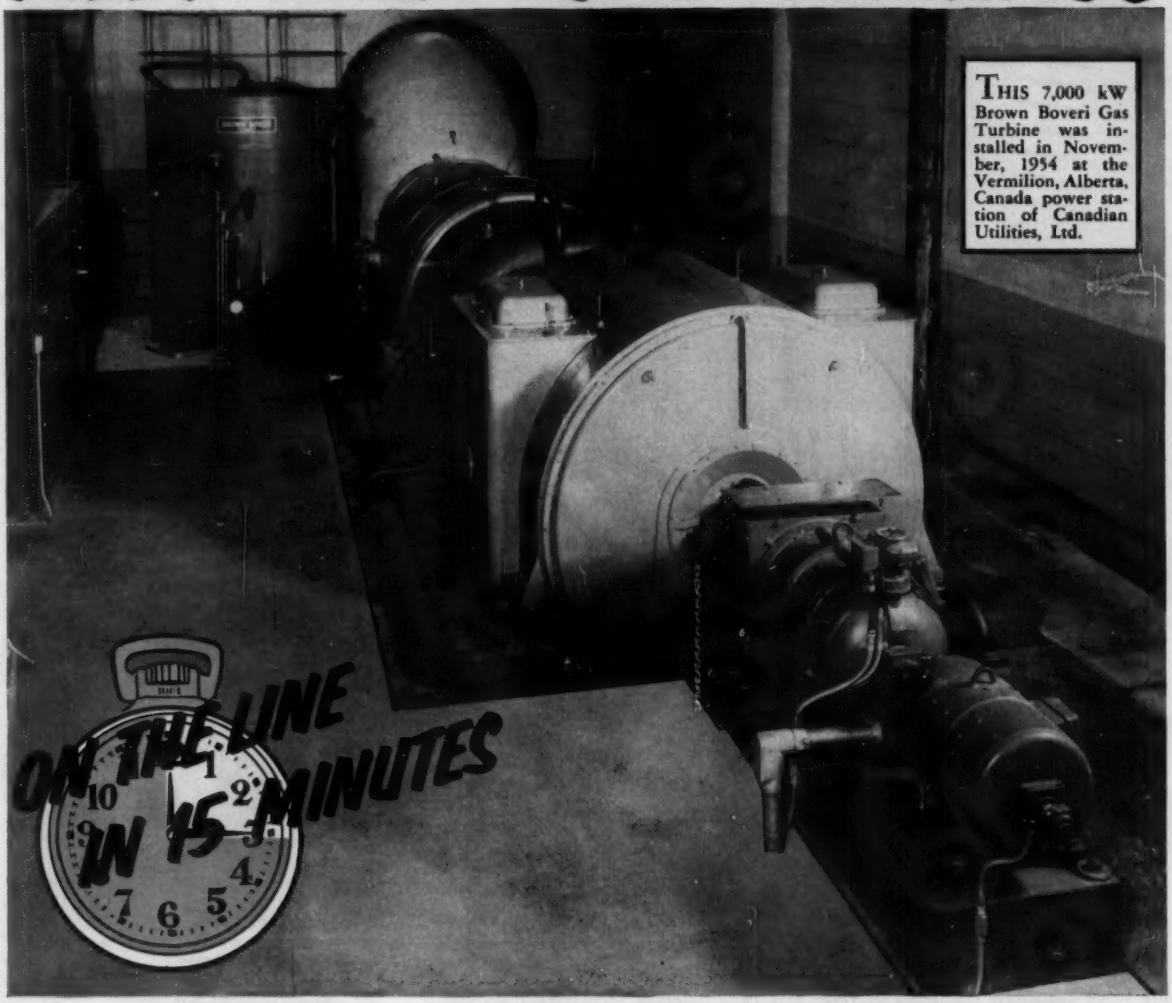
Available in 63 standard units

Grinnell Variable Spring Hangers are available in 21 sizes each of short, standard and double spring models . . . for maximum travel of 1¼, 2½ and 5 inches respectively within working load ranges. Load capacities extend from 43 lbs to 30,550 lbs. The maximum variation in the standard size per ½-inch deflection is 10½% of rated capacity; inversely proportional in short spring and double spring models.

For further information

If you have a pipe suspension problem, you are invited to write: — Grinnell Company, Inc., 252 West Exchange Street, Providence, R. I.

MEET PEAK LOAD DEMANDS



THIS 7,000 kW Brown Boveri Gas Turbine was installed in November, 1954 at the Vermilion, Alberta, Canada power station of Canadian Utilities, Ltd.

THE Brown Boveri 7,000 kW single shaft gas turbine is the answer to the rigid demands of *Peak Load* service. Full load can be reached in 15 minutes or less from a cold start.

In-the-field performance records of over 50 such units — in peak and base load service throughout the world — prove their economy of operation. They require a minimum of manpower and maintenance; they burn gaseous or liquid fuel; and they effect economies in building construction, foundations and overall capital outlay.

Whether yours is the problem of peaking or base load service you'll find it profitable to investigate Brown Boveri Gas Turbines.

Full details available for the quality- and economy-minded. Send for them NOW!

BROWN BOVERI CORPORATION

19 RECTOR STREET • NEW YORK 6, N. Y.

Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Buffalo, N. Y. • Butte, Mont. • Chicago, Ill. • Cleveland, O. • Denver, Colo. • Detroit, Mich. Hamilton, O. • High Point, N. C. • Houston, Tex. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Lewiston, Me. • Miami, Fla. • Minneapolis, Minn. New Orleans, La. • New York, N. Y. • Pasadena, Cal. • Portland, Ore. • Roanoke, Va. • San Francisco, Cal. • Seattle, Wash. • Syracuse, N. Y. • Tucson, Ariz.

BROWN BOVERI

NEW K-BAN PENTA POLE BANDAGE

CUTS COST OF GROUND-LINE PROTECTION

Clean, easily applied K-BAN provides Penta protection . . . always ready for quick application wherever needed

TEAR-STRIP adds to K-BAN convenience. Bandages are available in sizes to fit all poles.

OPENED BANDAGE is wrapped around pole and stapled in place, top edge 2" above ground line.

COMPLETED TREATMENT looks like this. Shovel, wire brush and staples are only tools needed.

New K-BAN is a pole-saving ground-line bandage designed for easy, fast, clean application. It is completely sealed, ready for instant use.

Inside the tough plastic-coated kraft paper backing is POL-NU, a grease-type protective compound containing 10% PENTAchlorophenol. Water soluble, highly toxic sodium fluoride is also incorporated in K-BAN as an added feature. When wrapped around the pole at the ground-line, K-BAN provides a reservoir of preservatives which work into the wood to prevent decay and termite attack in this vulnerable area.

K-BAN bandages are low in cost and far more economical to use than conventional methods of ground-line preservative treatment. They give many years of extra pole life, cutting maintenance and replacement costs. Send coupon below for price list and additional information.

PROTECT OLD POLES, CHANGE-OUTS AND DAMAGED POLES WITH K-BAN

Make K-BAN Bandages standard equipment with all line crews

K-BAN—Trademark of Forestry Enterprises, Inc., St. Paul, Minn. Patents pending.
POL-NU—Registered trademark of Chapman Chemical Company, Memphis, Tenn.

CHAPMAN®

CHAPMAN CHEMICAL COMPANY
Leading manufacturer of wood preservatives
Memphis 1, Tenn.
Minneapolis, San Francisco, Portland, Ore., Charlotte, N. C.

Mail for K-BAN prices and data

Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.

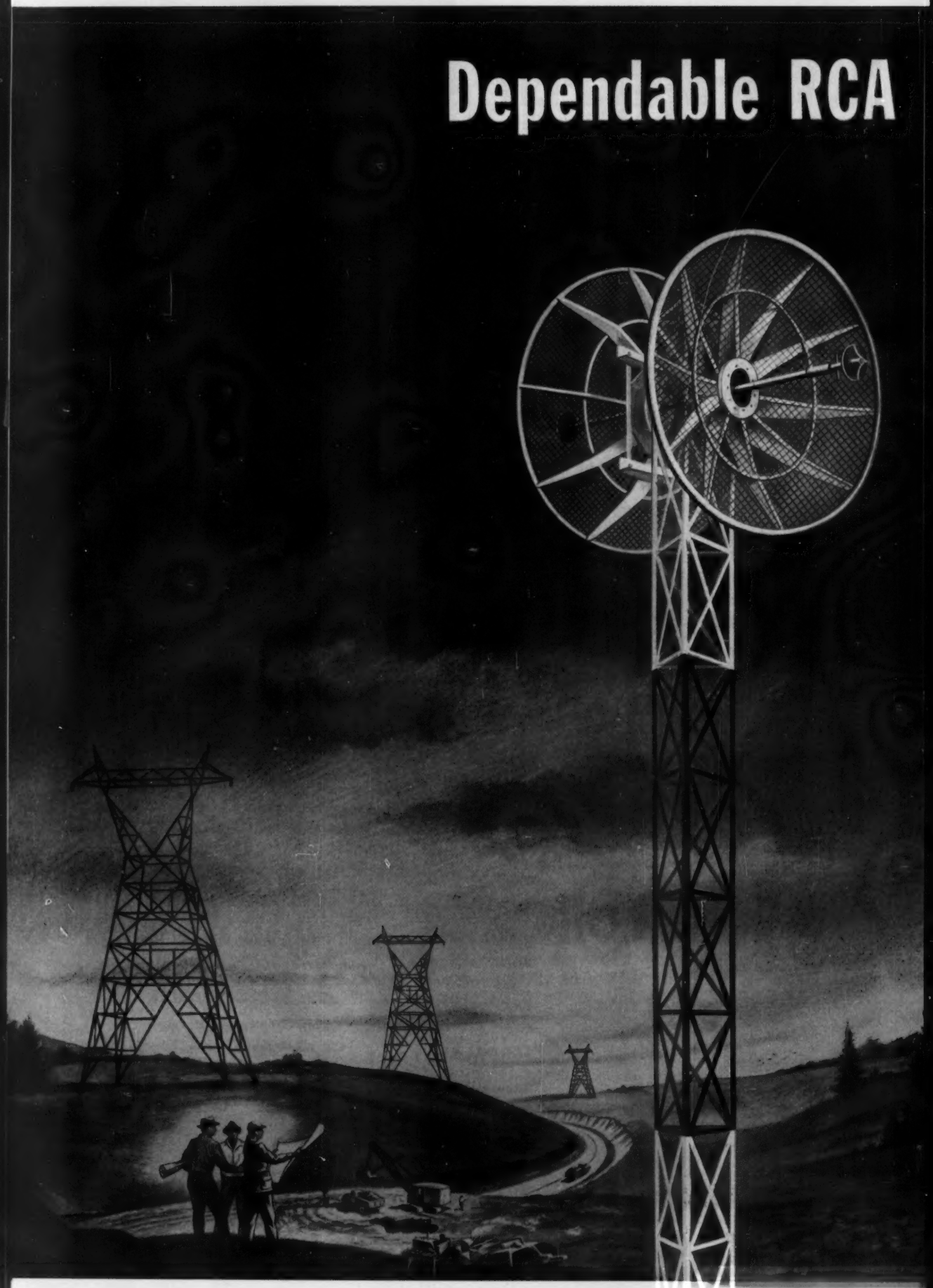
Please send prices and additional information on K-BAN to:

Name_____

Address_____

_____

Dependable RCA



Microwave
KEEPS UTILITIES ON THE BEAM

In a tremendous surge of expansion, electric utilities are putting up new installations essential to the national economy, right across the nation.

RCA Microwave is providing these utilities with dependable communications systems, easily expandable, capable of handling every vital communication function including voice, teletype, telemetering, supervisory control, load control, relaying and transfer trip, facsimile, remote control, operation of mobile radio and others.

Through the use of microwave, voice or data intelligence reaches every part of the territory served and the whole system can be under the dispatcher's immediate control.

All this is accomplished with speed, efficiency, reliability and economy compatible with and, in most cases, superior to that provided by any other means—without high maintenance costs, expensive right-of-way problems, or vulnerability to weather vagaries.

ON PIPELINES—In the petroleum and natural gas industries where pipelines knife across the country, RCA Microwave systems link dispatching and control points with pumping stations and unattended remotely operated booster stations. Pipeline capacity is increased and operating costs are cut. VHF control channels allow immediate contact with maintenance personnel.

ON TURNPIKES—On the new cross-country superhighways RCA Microwave provides circuits for voice, facsimile, teletype, VHF control, traffic information and business machine communications . . . gives operating personnel complete control of the road, greater safety and service to driver patrons around the clock, in fair weather or foul.

RCA MICROWAVE provides the most advanced engineering features. Provision for the easy addition of future channels makes it the least expensive form of communication per channel mile. Equipment uses easy-to-service, familiar circuits and readily available tubes. Single sideband suppressed-carrier frequency division multiplex is used exclusively to meet high standards of dependability and quality of transmission. Frequency control for the system is concentrated at the terminal stations. And only *two* frequencies are usually required. Furthermore, RCA provides the nation-wide service of the RCA Service Company to keep your system operating at its peak.

RCA Microwave Representatives, with years of microwave experience, will be glad to answer any questions and to assist in planning your installation. Mail coupon for further particulars.

RCA MICROWAVE is easily interconnected with mobile radio installations as well as existing telephone lines and switchboards. Field maintenance crews, no matter how remotely located, can be contacted from any station or office. Instant communication in the field means hours per day saved in parking, backtracking and preventing costly delays.

PERFORMANCE PROVED IN MORE THAN A MILLION CHANNEL MILES OF OPERATING SYSTEMS THROUGHOUT THE WORLD

RCA MICROWAVE

POINT-TO-POINT COMMUNICATION

RCA

RADIO CORPORATION OF AMERICA

Communications Products

Radio Corporation of America
Communications Products, Dept. RB-45
Building 15-1, Camden, N.J.

☐ Please send me latest literature on RCA Microwave.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

FULL STEAM AHEAD-

AT UTAH
POWER & LIGHT CO.

with Chase® Condenser Tube!

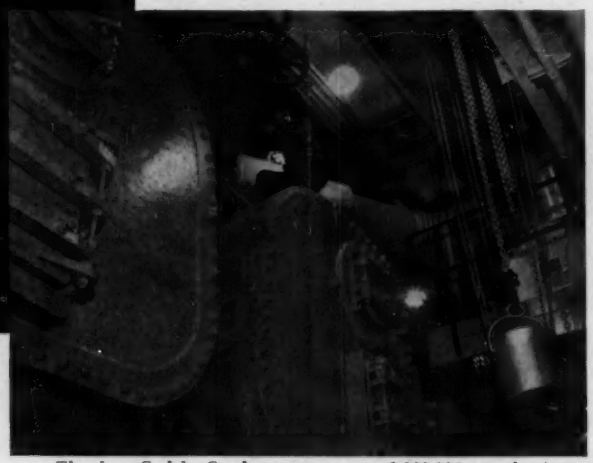
It's a big job keeping up with the light and power needs of the Intermountain area! Demand has more than doubled in the last 15 years...keeps growing all the time.

But at its Gadsby Steam Electric Plant in Salt Lake City alone, Utah Power & Light Co. has 20,396 "helpers" to depend upon. That's how many Chase Antimonial Admiralty Tubes keep three giant condenser units humming all the time.

No power failure due to tube failure here. Just the right amount of antimony guards Chase tube from de-zincification. And Chase quality control assures long, trouble-free tube life.

Shouldn't *you* be using Chase Antimonial Admiralty, too?

When you install Chase Condenser Tube, count on years of service ahead!



The three Gadsby Condensers turn some 2,100,000 pounds of steam back to water every hour at full plant load of 241,000 kw.

Chase BRASS & COPPER CO.
WATERBURY 20, CONNECTICUT
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass, Copper and Stainless Steel

Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York (Maspeth, L. I.) Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

Communications Products

City_____ Zone_____ State_____

If you flew into Ft. Worth tonight...

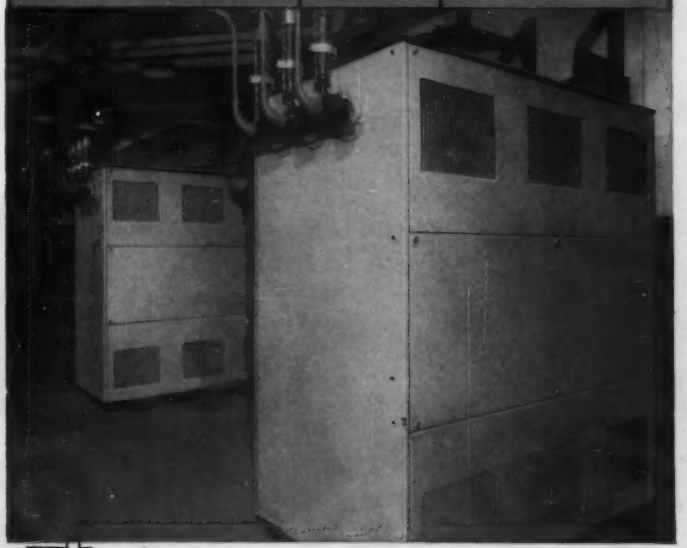
Your landing would be lighted with power from the world's SAFEST DRY-TYPE TRANSFORMERS

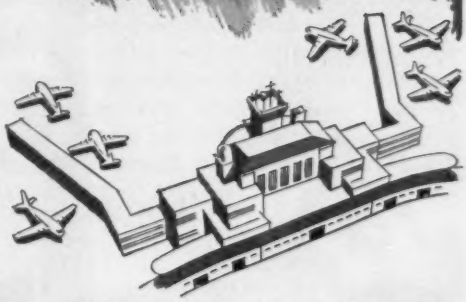
PENNSYLVANIA *Silicone-Insulated* TRANSFORMERS

at Greater Ft. Worth International Airport

are 1000-kva ventilated units, three phase, 60 cycles, 150 C. rise, 12470Y — 480Δ volts. Silicone-Insulated Transformers (formerly known as "Class H", now NEMA Group 3) were pioneered by Pennsylvania. The following types and sizes now are available:

TYPE	KVA	VOLTAGE
Ventilated	Up to 3000	Up to 15 kv
Sealed-in Nitrogen	Up to 2000	Up to 15 kv





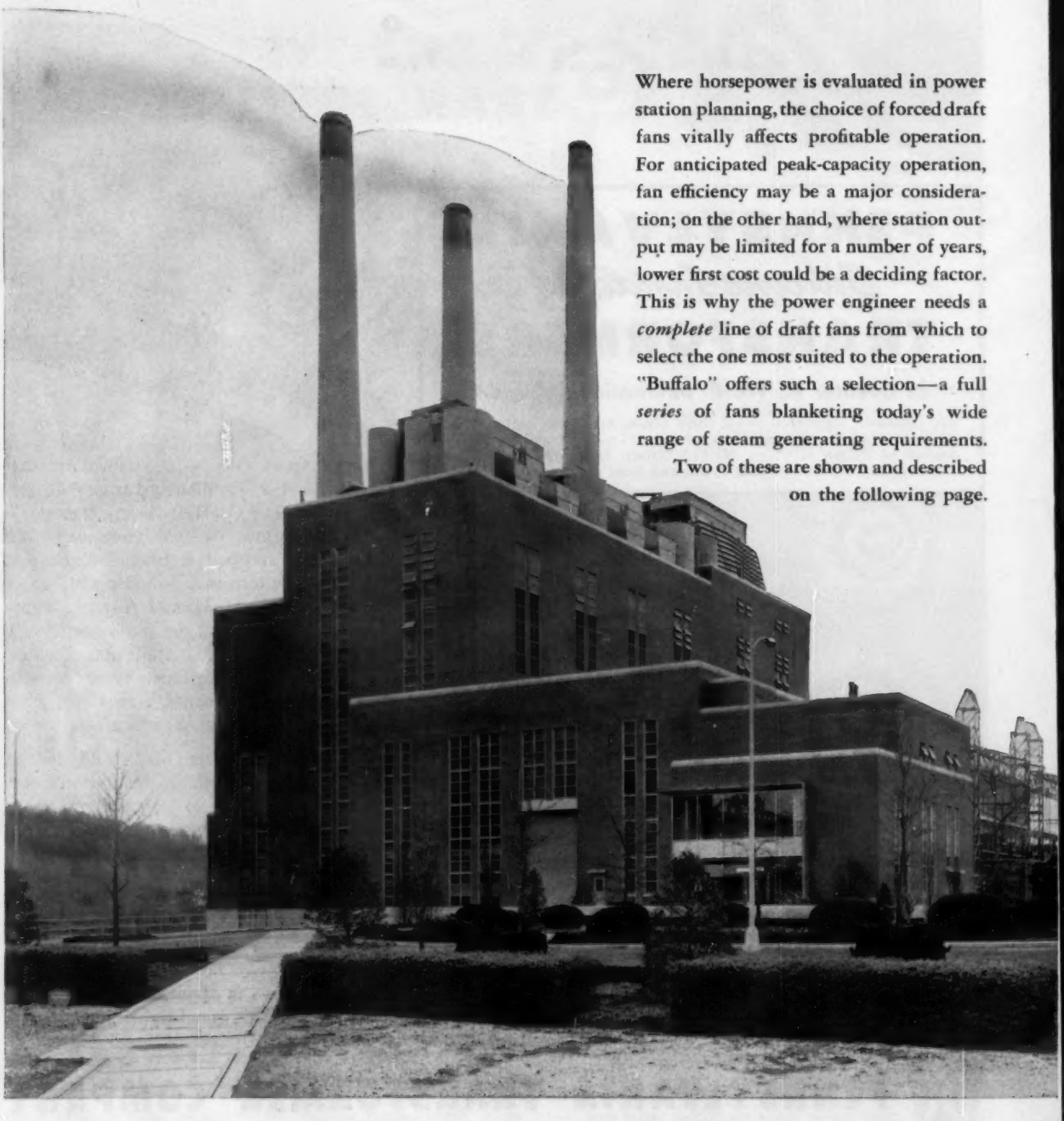
Power from two of the world's safest transformers — Pennsylvania *Silicone-Insulated* 150 C. Rise Transformers — would continue to light your way even after you stepped from the plane and entered the terminal building at Greater Ft. Worth International Airport. These two 1000-kva dry-type units are ideally suited for indoor installation because there is *no fire or explosion hazard* as with oil-filled transformers . . . *no risk from toxic fumes as* with Askarel units.

Also important, from the standpoint of public safety, is silicone insulation's *outstanding resistance to moisture* and other potential contaminants — one of the principal reasons for the trouble-free operating records of scores of Pennsylvania Silicone-Insulated units in service throughout the country. Such dependability — plus an *exceptional overload capacity* that can be called on in case of emergency — is of vital importance for the field and terminal lighting system at busy Ft. Worth International Airport.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

WHERE HORSEPOWER IS EVALUATED



Where horsepower is evaluated in power station planning, the choice of forced draft fans vitally affects profitable operation. For anticipated peak-capacity operation, fan efficiency may be a major consideration; on the other hand, where station output may be limited for a number of years, lower first cost could be a deciding factor. This is why the power engineer needs a *complete* line of draft fans from which to select the one most suited to the operation. "Buffalo" offers such a selection—a full *series* of fans blanketing today's wide range of steam generating requirements.

Two of these are shown and described on the following page.

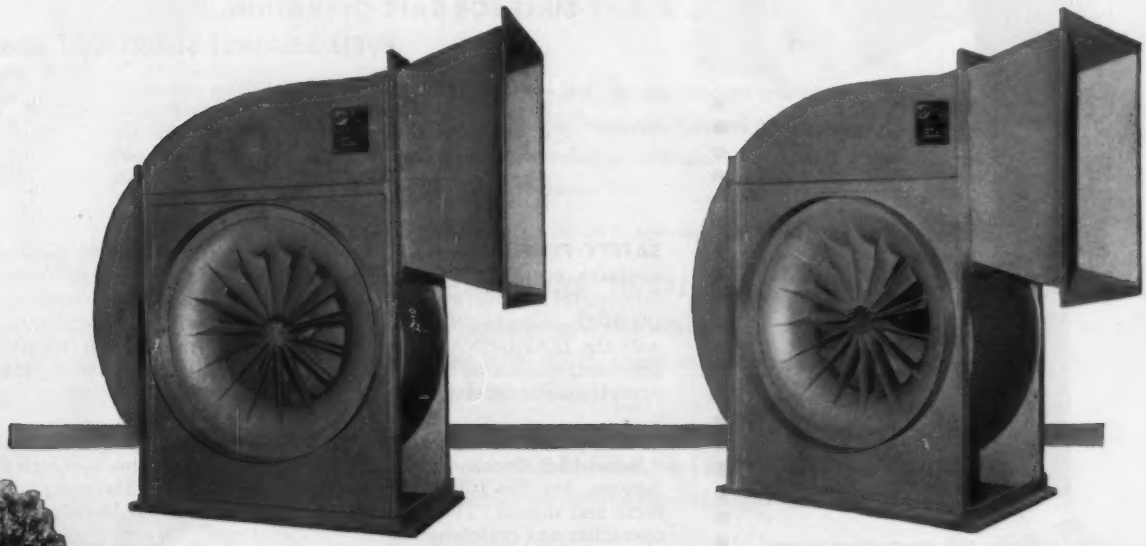
— THESE "BUFFALO" DRAFT FANS
OFFER IMPORTANT ADVANTAGES

High Efficiency Over a Broad Range—Type "BLH" F. D. Fan

This backward-curve fan is providing performance characteristics highly desirable for many stations. Designed for Classes II-IV operation (system pressures above 3¾"), its mechanical efficiency is above 80% over a very broad range, providing flexibility over wide load variations. Its complete streamlining includes the proven inlet bell, directional inlet vanes, backward curve blades, wheel-suited housing and divergent outlet — features offered exclusively by "Buffalo". Like the "Buffalo" Airfoil Fans, the "BLH" is used efficiently with "Buffalo" Variable Inlet Vane volume control. Write for Bulletin F-200.

Maximum Efficiency for Specific Operating Conditions— Type "BA" Airfoil F. D. Fan

"Buffalo" Airfoil Fans offer mechanical efficiency up to 92%, and are available with a choice of three wheels to match widely varying pressure requirements. These fans have extra-wide blades for a deep "bite" — extremely good inlet conditions, thanks to the smooth inlet bell and matching curved wheel flange — plus excellent static conversion thru the unique new "Buffalo" divergent outlet. Available with "Buffalo" Variable Inlet vanes — which do not reduce performance — for volume control. Write for Bulletin FD-106 for full details.



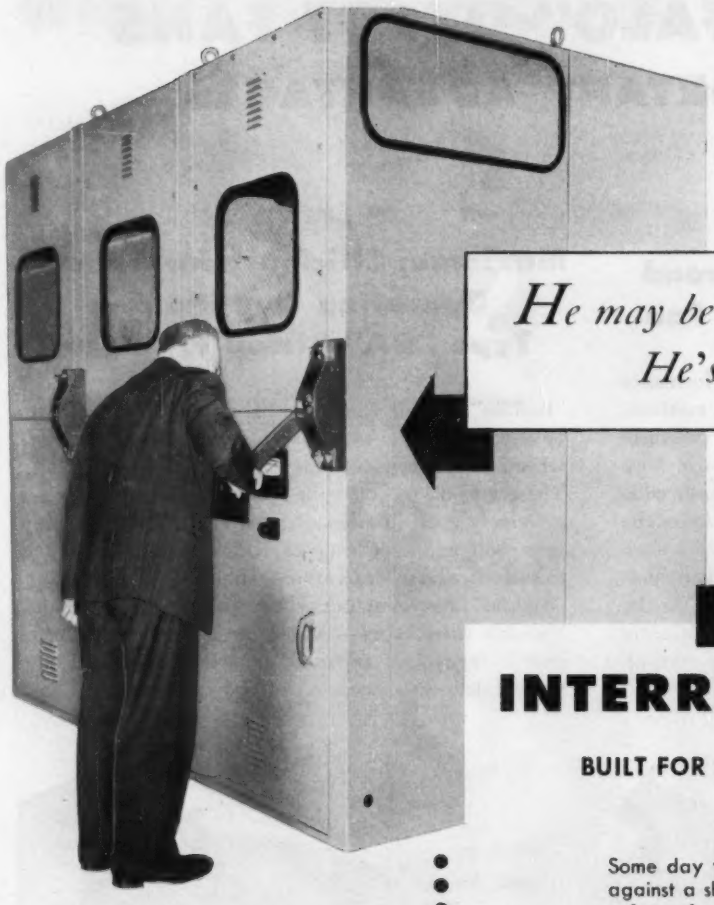
In every "Buffalo" product is the "Q" Factor, or built-in Quality which provides trouble-free satisfaction and long life.

BUFFALO FORGE COMPANY
BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING



He may be closing against a fault.
He's not worried . . .

It's an

HPL-C
INTERRUPTER SWITCH

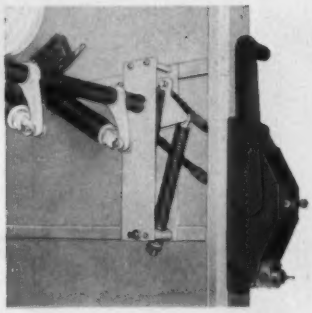
BUILT FOR SAFE OPERATION— EVEN AGAINST SHORT CIRCUITS

Some day you may close an interrupter switch against a short circuit. For your safety, and the safety of your equipment, be sure your interrupter switches are HPL-C and operate with TOG-L SNAP mechanisms.

SAFETY FEATURES—(1) HPL-C closes in on special heavy closing contacts, outside the interrupter—thus preventing damage to the interrupter switch when closing in on moderate fault currents; (2) High velocity "OVR-CENTR" blade closing (and opening) with the TOG-L SNAP operating mechanism—an optional feature, providing additional safety, important especially during the closing operation. For safety sake, specify these important features.

TESTS—Actual closing against moderate 3-phase fault currents at 4.8 and 13.8 Kv has proven that the HPL-C offers this protective feature. Ask the I-T-E Representative to give you the complete facts and details. They will show real economies on installation, operation and maintenance.

Supplied by leading electrical equipment assemblers, switchboard builders and transformer manufacturers in switchboards and unit substations.



TOG-L SNAP—The high velocity blade operating mechanism. Optional, and important to safe closing-in operation.

RATINGS—Fused HPL-C Interrupters
Up to 14.4 Kv (110 BIL)
400 Amperes—(40,000 Amp. Mom.)
1200 Amperes—(60,000 Amp. Mom.)

R&IE

R&IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

HPL-1

NOW! Reliable

ALL-ALUMINUM

SQUEEZ® SLEEVES

in all service entrance combinations

ALUMINUM - ACSR - COPPER from SIZES No. 10 to No. 2

These heavy-wall, all-aluminum *SQUEEZ* Sleeves are cleaned, greased and capped, ready for use. The colored plastic caps that code the sizes need not be removed, they are punctured by conductors. The solid center barrier locates and separates conductors and assures an even distribution of the factory added grease to all strands within the sleeves.

Fifteen sleeves, color coded and marked provide for all conductors No. 10 to No. 2.

RELIABLE NO. 10-XPJ *SQUEEZ* TOOL

For maximum versatility with minimum truck and working space, the Reliable No. 10-XPJ combines three standard die grooves in a toggle type tool.

Handles are coated with bright orange vinyl plastisol that provides insulation when used for work on secondaries. Also available with painted handles. Bright color helps avoid loss.

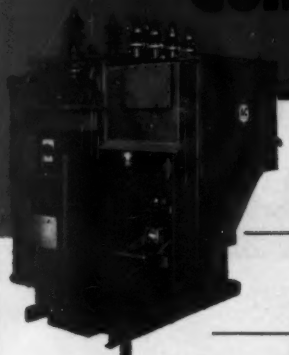
FREE SAMPLES Just ask for your free samples of Reliable Aluminum *SQUEEZ* Sleeves . . . they'll be sent promptly.

Reliable ELECTRIC COMPANY CHICAGO 12, ILLINOIS

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

How regulators

Compare cost of LTC transformers



LTC on transformer with ±10% regulation	$12,287
3 Distribution regulators with conventional +10% −10% regulation	$11,670
3 Distribution regulators provide +10% −5% system regulation using *VARI-AMP*	$ 7,572
Maximum savings (using *VARI-AMP*)	$ 4,715

Here are the four steps needed to make this comparison:

1. Select substation size.
2. Determine percent regulation required.
3. Select proper size regulating unit based either on current or kva, and range of regulation required.
4. Compare cost of LTC portion of transformer and 3 Allis-Chalmers distribution regulators.

In this example, the substation size is 3750 kva, 164 amperes, 13,200 volts, self-cooled. Regulation required is +10% −5%.

Key to Savings is unequal range of regulation using Vari-Amp

Regulators or LTC could be provided for ±10% regulation. But there's a money saving way using *Vari-Amp* where less than ±20% regulation is required.

In this case, regulation needs are figured either on basis of setting permanent taps of transformer up 5%, or using an alternate voltage on low voltage winding to provide a 5% boost. Then only a 5% raise from the regulator is needed. The transformer raises voltage 5%; regulator raises voltage 5% . . . a net raise of 10%.

This requires regulators to carry 3750 through kva or 164 amperes at the 5% *Vari-Amp* position.

On minimum load the transformer raises voltage 5%, regulator lowers voltage 10%, which gives a net result of −5%. The regulator is allowed to go to −10% because load current has dropped below the 10% current rating of the regulator.

The selection: regulators rated 76.2 kva, 7620 volts, 160 amperes. Comparing costs shows a saving of $4715 using Allis-Chalmers distribution regulators with *Vari-Amp*.

See what you can save! Get a bid on A-C regulators next time you figure a substation. Ask your nearby A-C office for Key to Low Cost Regulation, No. A-5307, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

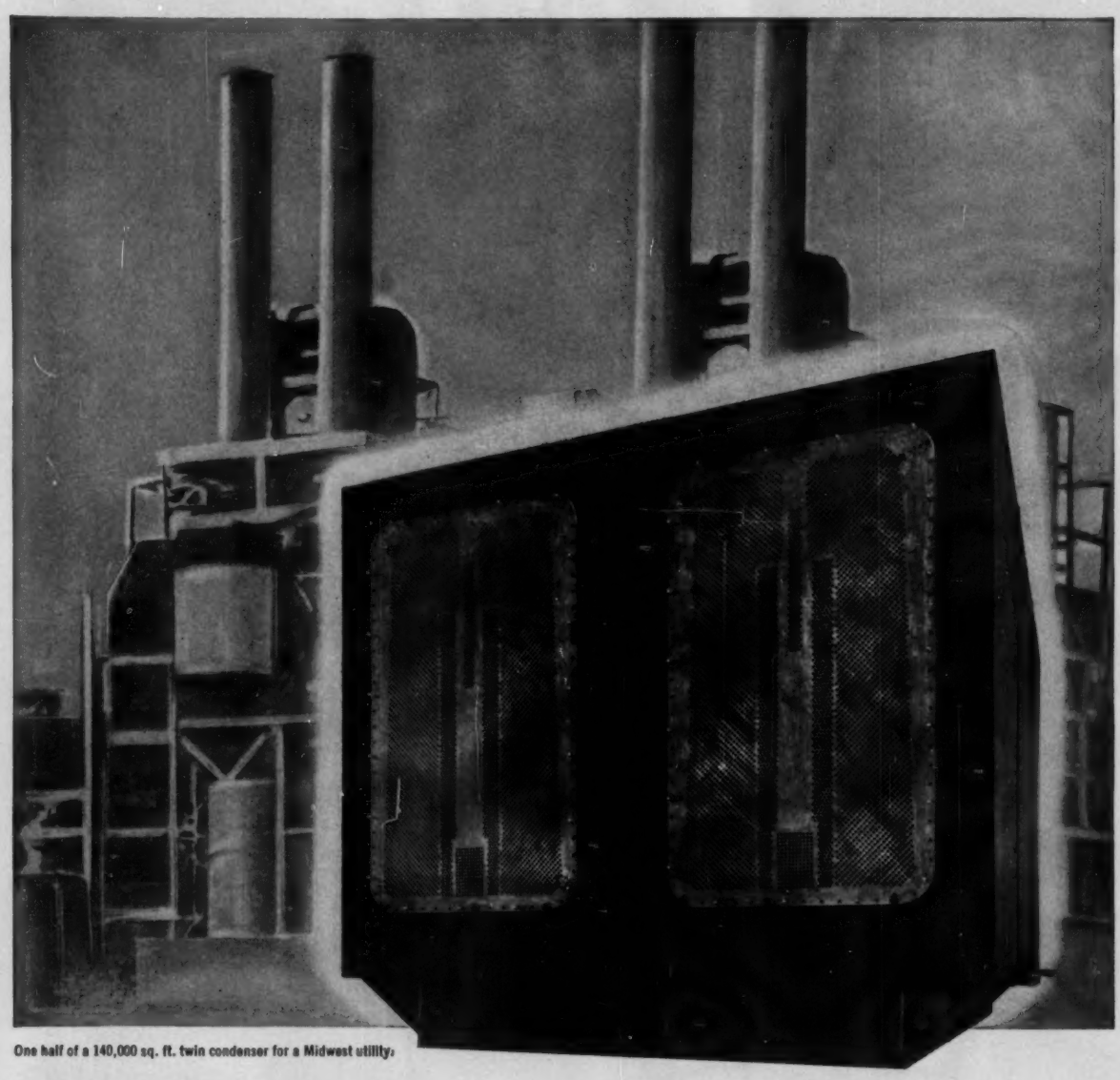
save $4715

and regulators

A-C ALLIS-CHALMERS

Allis-Chalmers
Originators of:

- 5/8% Step Regulators
- Unit Construction
- VARI-AMP



One half of a 140,000 sq. ft. twin condenser for a Midwest utility.

C. H. WHEELER Principles of Steam Condenser Design Win Approval of Large Utilities

To help modern power plants conserve every BTU of boiler fuel C. H. Wheeler is working constantly to design and build more efficient steam condensers. Here are just a few of the more important features in C. H. Wheeler Dual Bank Condensers that are recognized by large utilities:

- *Deaeration . . . 0.01 cc per liter is attainable.*
- *"Zero" condensate temperature depression.*
- *Purity of condensate.*
- *Additional steam lanes shorten path and resistance to steam travel.*
- *Lower pressure drop and higher vacuum.*
- *Specifically designed for larger, more efficient electric generating stations.*
- *Adaptable to any station layout and designed to minimize field erection problems.*

C. H. Wheeler representatives are located in principal cities. Let us present a proposal for the most modern Steam Condenser, Pumps and Auxiliaries for your electric generating plants of tomorrow.

C. H. WHEELER MANUFACTURING CO., 19th & LEHIGH, PHILADELPHIA 32, PA.

Steam Condensers • Vacuum Equipment • Pumps for Circulating Water, Condensate, Water Supply and Drainage • Marine Auxiliary Machinery • Special Products for Atomic Service

C.H. Wheeler OF PHILADELPHIA

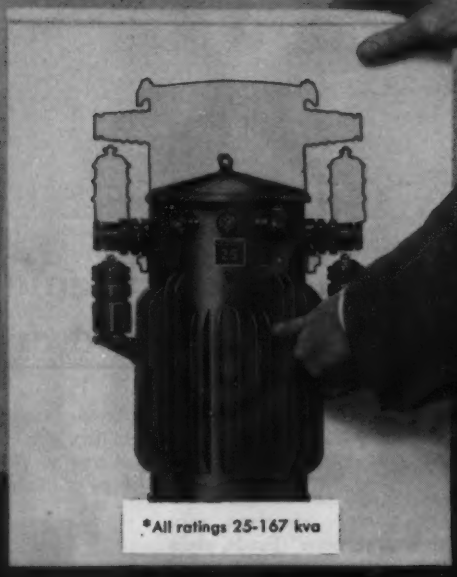
Your Westinghouse representative can prove...

NEW CHANGEOUT SAVINGS

Because all new Westinghouse transformers* are up to 13" shorter, 33% lighter, you can now make changeouts to next higher kva ratings without replacing poles or relocating secondaries

Among major utilities enjoying the advantages of Westinghouse "new-size" full-capacity transformers is Alabama Power Company, whose D. D. Wendel, manager of transmission and distribution, is seen here with John Main, Westinghouse Birmingham representative.

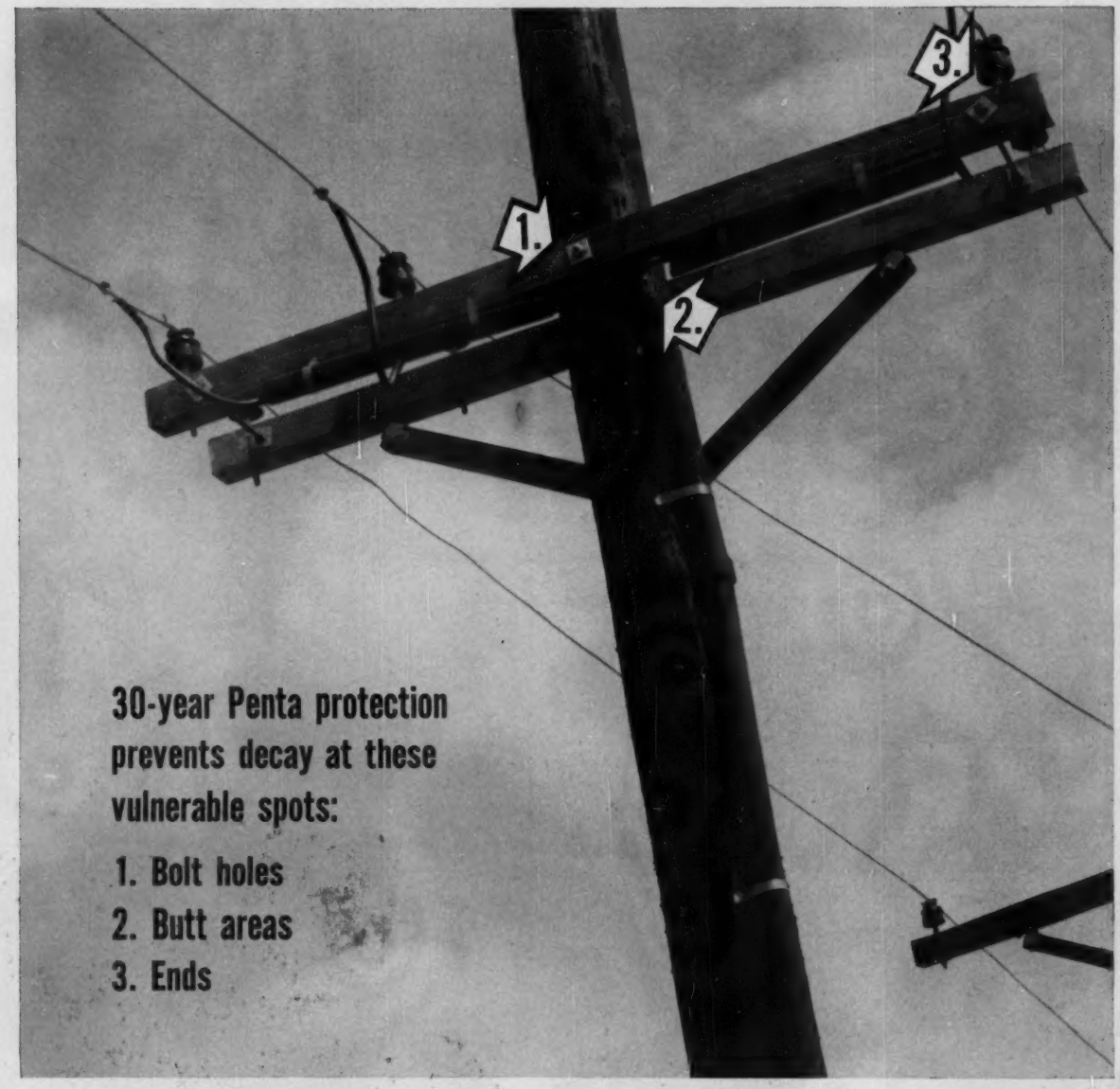
J-70787



*All ratings 25-167 kva

YOU CAN BE SURE...IF IT'S

Westinghouse



Cut replacement costs...make your whole pole plant last longer with clean Penta-treated crossarms!

Doesn't it make good sense, in view of rising crossarm installation and replacement costs, to use Penta-treated crossarms *as well as Penta-treated poles.* By using Penta-treated crossarms, your whole pole plant is assured maximum in-service life and freedom from periodic, costly maintenance and replacement.

Penta-treated crossarms last 30 years and longer. They're immunized against decay—especially where it is most likely to occur—at bolt holes and where arm butts pole. Penta also holds end-fraying in check.

Easy to handle. Penta-treated crossarms . . . and poles . . . are clean, easy to handle. Won't "burn" hands, stain clothing. Installations go up fast.

Specify Penta! Your near-by treating plant is equipped to supply *all* your Penta-treated forest products needs for crossarms, poles, transformer platforms, braces, planking. Write us for your list of treating plants and your informative copy of "Poles and Crossarms."

Organic Chemicals Division
MONSANTO CHEMICAL COMPANY
Dept. PI-13, St. Louis 1, Missouri

MONSANTO

WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

MEASURE OF A MAN

Technically, this jeweled lapel pin measures a mere 0.370 inches. But, in terms of what it represents it is the measure of a man—his depth and breadth of experience, his ability to help you.

The man is your Socony Mobil representative. The pin represents twenty years of service. Almost half of our lubrication engineers and salesmen wear it. In fact, the average length of service of *all* Socony Mobil representatives is over 17 years.

This great background of practical experience, coupled with the most comprehensive lubrication program ever offered by any petroleum company, is yours when you depend on Mobil products.

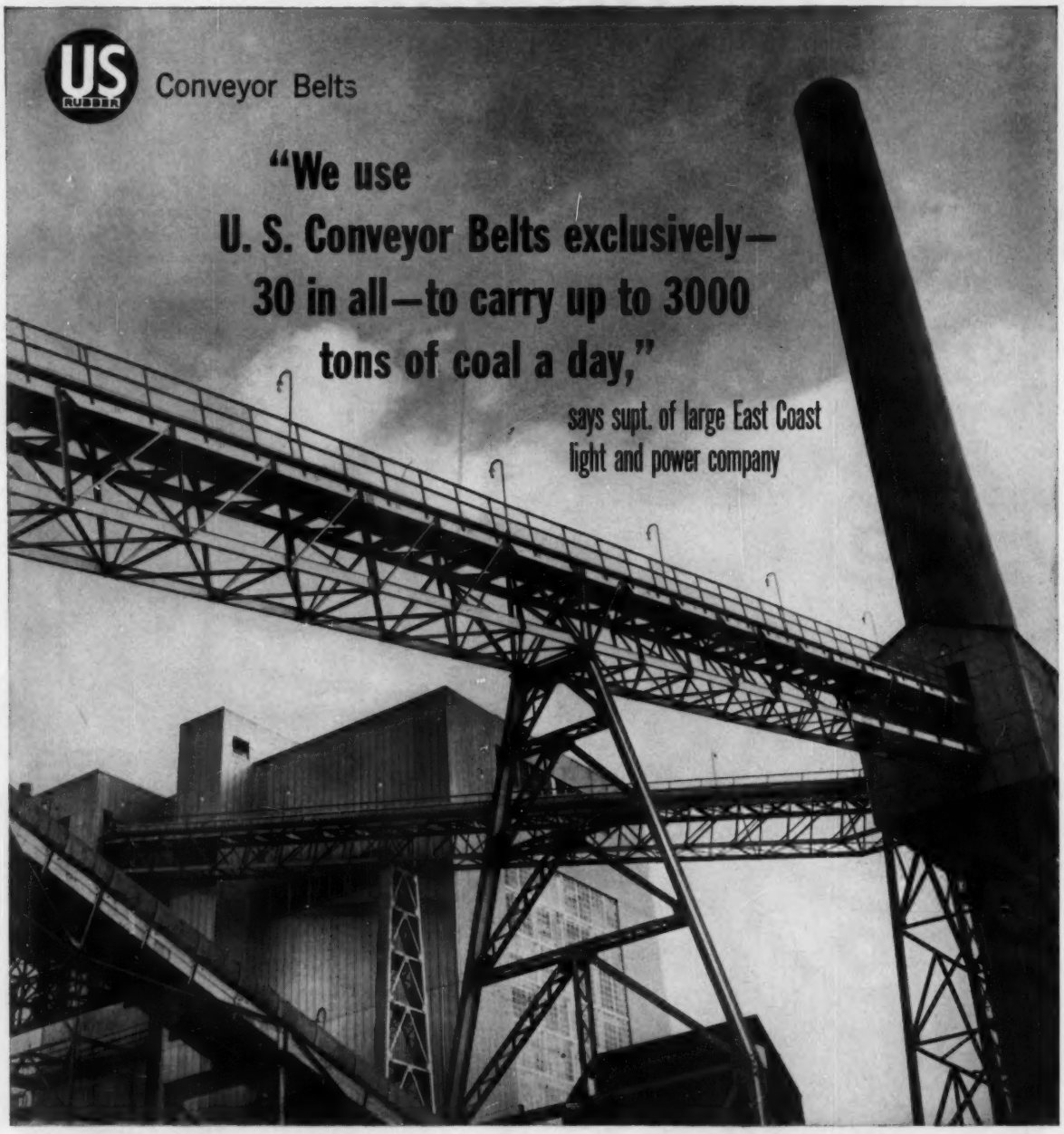
This combination has resulted in improved production, reduced maintenance costs for thousands of industrial plants. Why not yours?

Leader in lubrication for 91 years

SOCONY MOBIL Mobil *Correct Lubrication*

A proved program to reduce maintenance costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.


US RUBBER
Conveyor Belts
"We use
U. S. Conveyor Belts exclusively—
30 in all—to carry up to 3000
tons of coal a day,"
says supt. of large East Coast
light and power company

The giant generating plant of this large New England light and power company, furnishes enough electric power for a city of 165,000 people. Thirty "U.S." Conveyor belts carry the 3000 tons of fuel in a round-the-clock operation.

"Our needs are constantly expanding," says the super, "and we intend to use 'U.S.' belts exclusively. Belting is the best way to carry coal . . . and the best belting is U.S. Rubber. Maintenance is usually confined to inspection and lubrication. We expect many years of service from these belts."

That's the story everywhere. High-volume operators are using "U.S." Belting, and the result is always *lower costs.* Like so many other successful belting installations, the system in this light and power plant is the result of United States Rubber's "Three-Way Engineering"—in which "U.S." engineers work with the engineers of the conveyor builders and engineers of the power company to turn out the best belt conveyor system for the specific job.

U. S. Rubber Conveyor Belts and expert engineering assistance are available at any of the 28 "U.S." District Sales Offices, or write us at Rockefeller Center, New York 20, N.Y.

US RUBBER

Mechanical Goods Division

United States Rubber

RECOGNIZED RELIABILITY

69KV

NEMA TR16

RECOGNIZED RELIABILITY IS EARNED —

— and maintained only by vigilant adherence to "proven" control procedures that are our STANDARDS in the manufacturing of PORCELAIN PRODUCTS APPARATUS INSULATORS.

Several "STANDARD" procedures are illustrated here.

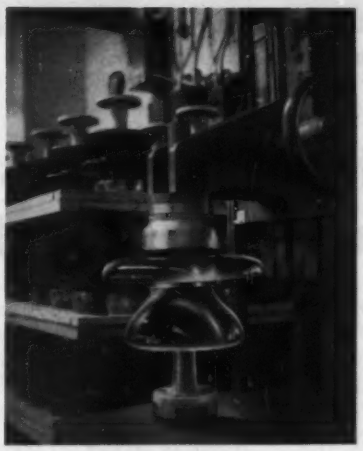
1. DUAL PURPOSE ASSEMBLY JIGS and CURING UNITS.

Prior to assembly of porcelain shells and hardware components, each assembly jig is checked by a Precision Gauge Block to insure exact height, perfect alignment of cap and base mounting holes - this exactitude guarantees complete interchangeability of apparatus insulators.

After the insulator and hardware components are assembled with Insulator Grade Neat Portland Cement the hoods are lowered into position and a complete curing (steaming) cycle takes place. At no time are the insulators moved until this curing cycle is complete.

2. After the routine Mechanical and Electrical test, each unit is double checked, as shown in the photograph at lower right, for parallelism of cap and pin, hole alignment and designated height requirements.

— this is STANDARD procedure - this is why our insulators enjoy RECOGNIZED RELIABILITY.

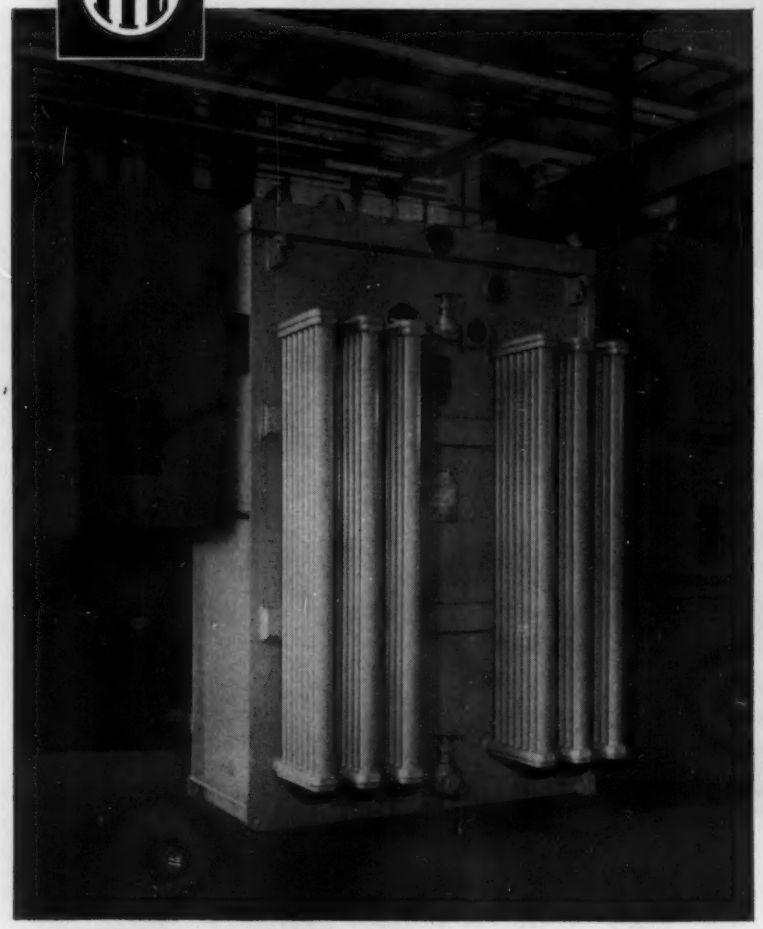


PP INC.

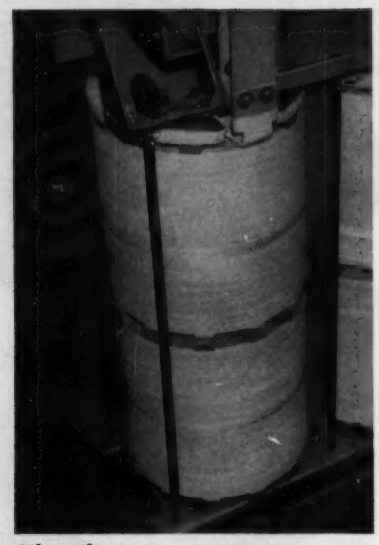
Porcelain Products, Inc.

High Voltage Division — Parkersburg, W. Va.

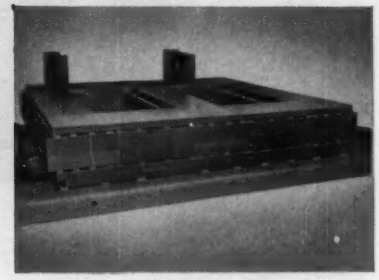
UNIT SUBSTATION TRANSFORMERS



No leakage here. Tanks on liquid-filled transformers are double welded—inside and out. Sides and cover are reinforced. Cover is gasketed and bolted in place.



Why coils stay put. Double jackscrews in combination with tie rods between upper and lower core clamps hold coils rigidly in place, even under severe stress.



Protection against noise. High-grade oriented silicon iron laminations are stacked flat on special tables. This keeps noise level low.

Resist heaviest stresses — even from frequent short circuits

Even if you don't anticipate frequent short circuits, you still benefit three ways from the extra strength and dependability built into I-T-E transformers:

1. *Less risk of trouble in service*
2. *Virtual freedom from transformer damage due to even abnormal stresses*
3. *Greater length of service*

I-T-E's ability to give you these important extra advantages comes from many years' experience building transformers for mechanical rectifiers and other special-purpose applications where direct short circuits are an ever-present possibility. Now the same construction is offered in transformers for substation use.

I-T-E transformers are available either ventilated dry type or immersed type and in a wide range of ratings. They are manufactured complete with all standard accessories and comply fully with all industry standards. The I-T-E factory is equipped to apply all NEMA tests. Write for complete information. I-T-E Circuit Breaker Company, Transformer & Rectifier Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

Transformer & Rectifier Division

IN CANADA: EASTERN POWER DEVICES, LTD.

NEW for '57

the new **Cavalier**®
AUTOMATIC ELECTRIC
WALL INSERT HEATERS

Model CW-2-G
(2 KW)

MODERN SWEEPING LINES!

New forward-thrust design. Holds draperies, furniture away from elements.

NEW AIR FLOW!

Deeply recessed frame rolls heat out into the room, away from walls. Radiated heat plus gently circulated warmed air. No moving parts. ⅓ more heated air up through the elements than any other gravity type heater now on the market.

SEVEN CAPACITIES

1, 1.5, 2, 2.5, 3, 4 and 5 KW capacities. The proper size for any job, no need to overheat or underinstall. High quality, liquid-filled thermostats provide zone control at its best, by individual rooms. Cavalier Wall Inserts are guaranteed against element burnouts for 10 full years.

SOLID ALUMINUM REFLECTORS

Cannot rust, have no plating to deteriorate, last a lifetime! Will not absorb heat . . . give your customers all the warmth they buy. Heaters are finished in rich, 2-tone Silver Craft enamel. Copper color cones. Blend with any interior. Cleaned in just 3 minutes with a soft cloth . . . without removing a single screw!

Sell Cavalier Electric Heaters and make a businesslike profit!
For complete information, see your distributor or write

ELECTRIC HEATING DIVISION
CAVALIER CORPORATION, CHATTANOOGA 2, TENNESSEE

---

and here's another ***NEW FEATURE!***

SURFACE MOUNTING ADAPTORS

These Wall Insert Heaters can be easily and quickly converted to Surface Mounted styling by using a special Adaptor Kit offered by Cavalier. Particularly desirable for concrete block or masonry construction, conversion work . . . anywhere it is impractical to cut holes in walls. Reduces the number of heaters you need to stock!

You can see why linemen prefer

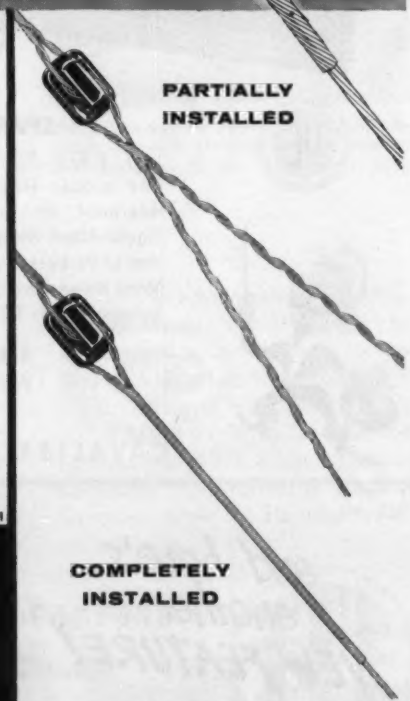
GUY-GRIP Dead-Ends

Linemen are enthusiastic!

PLP GUY-GRIP dead-ends are the easiest, fastest and safest method yet devised for dead-ending strand.

Installation is easy because it takes just one unit, no moveable parts, no bolts or clamps to tighten. It's fast. All you do is hand-wrap the dead-end legs around the strand.

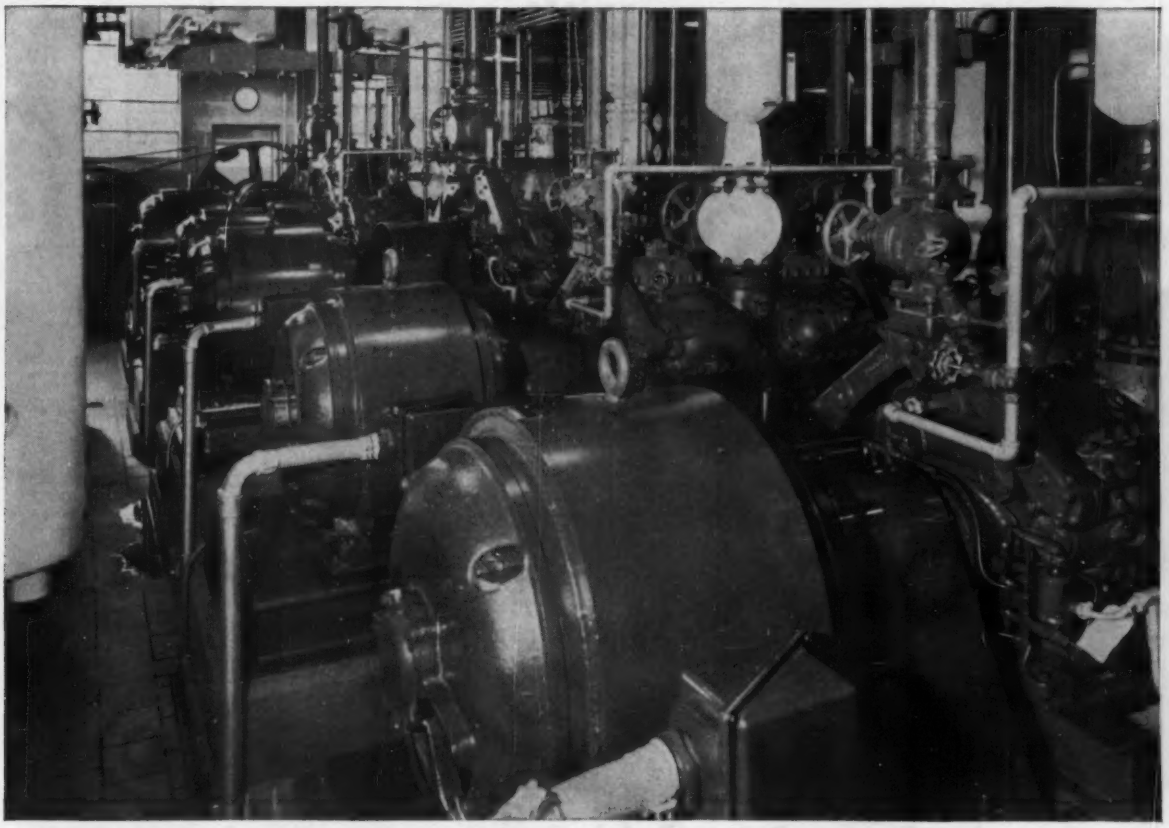
And it's safe. You can see at a glance that the installation is completed and thus secure. Linemen make better time, take pride in their work.
Dept. No. PR1C



PX-81

PREFORMED LINE PRODUCTS CO.
5349 ST. CLAIR AVE. • CLEVELAND 3, OHIO
TELEPHONE: CLEVELAND EXpress 2-4271

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents issued and pending.



Wagner Part-Winding Motor-Starter Combinations meet polyphase motor starting recommendations of AEIC-EEI-NEMA

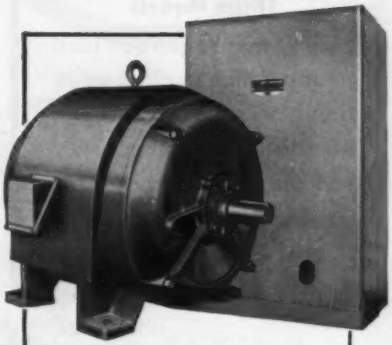
Eliminate "across the line" starts— cut voltage drop and line disturbance

This line of Wagner Increment Start Motors, ranging from 60 to 150 hp, and operating at speeds from 575 to 1160 rpm, drive compressors in a Memphis food processing plant. The motors start quickly and easily, with a minimum of line voltage disturbance, because they are designed for increment starting and are furnished with increment type starters.

Wagner Increment Motor-Starter Combinations provide *low cost control* . . . do not interrupt current between "start" and "run", as is the case with auto-transformer type starters . . . do not affect the running characteristics of the motors . . . yet fully meet the polyphase motor starting recommendations of the AEIC-EEI-NEMA.

Wagner two-step motor and starter combinations are suitable for most applications. For installations where unusually low inrush of starting current is required, Wagner can furnish 3, 4, 5, or 6 step increment motor-starter combinations.

For more information about these Wagner part-winding motor-starter combinations, and how they solve big motor starting problems, call the nearest of our 32 branches or write for Bulletins MU-128 and MU-195.



Type RP polyphase motor — in ratings to 500 hp. with increment type starter.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

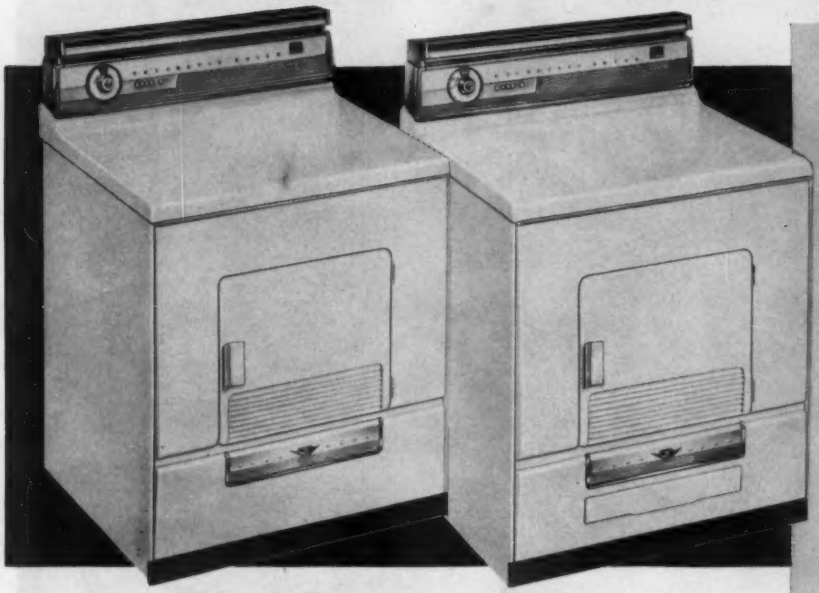
H57-9A

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Important to Utility Revenue!
there's a Hotpoint
Automatic Dryer To Fit Every Demand



Because automatic clothes dryers use an average of over 750 Kilowatt hours annually—*almost entirely concentrated in off-peak hours*—the clothes dryer load is becoming more and more important to utilities.

Here's the line of clothes dryers that helps you build this profitable load by surrounding every prospect with more reasons to buy. Hotpoint offers *two* types of Automatic Electric Clothes Dryers, in *seven* great new models.

There are three Sealed Chamber models that need no venting, and four Air-Blower Models with giant lint screen. A model for every need, every budget . . . and each is loaded with Hotpoint's famous pre-sold quality and convenience features that help you sell with a minimum of effort.

Your Hotpoint Distributor has the complete story on the widespread merchandising, acceptance and feature versatility of Hotpoint Automatic Dryers. Why not see him *today?*

Two Types—Seven Models

Hotpoint
Sealed Chamber Dryers
Three Models

No venting required! Ideal for installation in either utility room or kitchen. Purified, heated dry air takes moisture and lint from clothes. Cold water spray condenses moisture, and lint and water are pumped down the drain.

Hotpoint
Air-Blower Dryers
Four Models

Plug-in flexibility! One connection for either 115V or 230V operation. Hotpoint quality and convenience features, in a low price Air-Blower Dryer. Air-Blower models have giant Wide-Screen Lint Filter for increased drying efficiency.

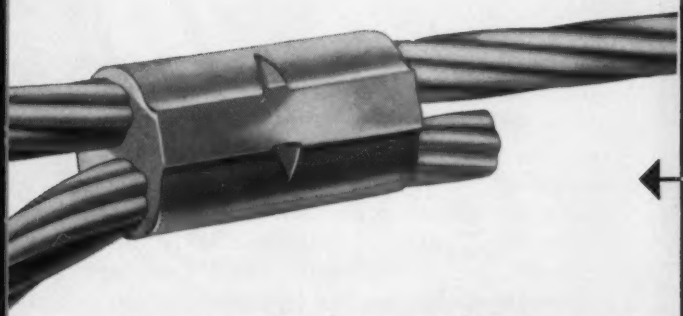
Hotpoint Automatic Electric Dryers put more *salespower* behind "HOUSEPOWER"—more *living* in "LIVE BETTER . . . Electrically"!

Again, Hotpoint *looks at Tomorrow, Today!*

CLOTHES DRYERS • AUTOMATIC WASHERS • RANGES • REFRIGERATORS • DISHWASHERS • DISPOSALLS® • WATER HEATERS • FOOD FREEZERS • AIR CONDITIONERS • CUSTOMLINE • TELEVISION

HOTPOINT CO., A Division of General Electric Company, 5600 West Taylor Street, Chicago 44, Illinois

Easy installation...dependable connections!



use

KEARNEY SQUEEZONS* ..... SERV-ENS

You connect for keeps with Squeezons!

Types for every open-wire distribution system connection . . . for all combinations of copper and aluminum conductors.

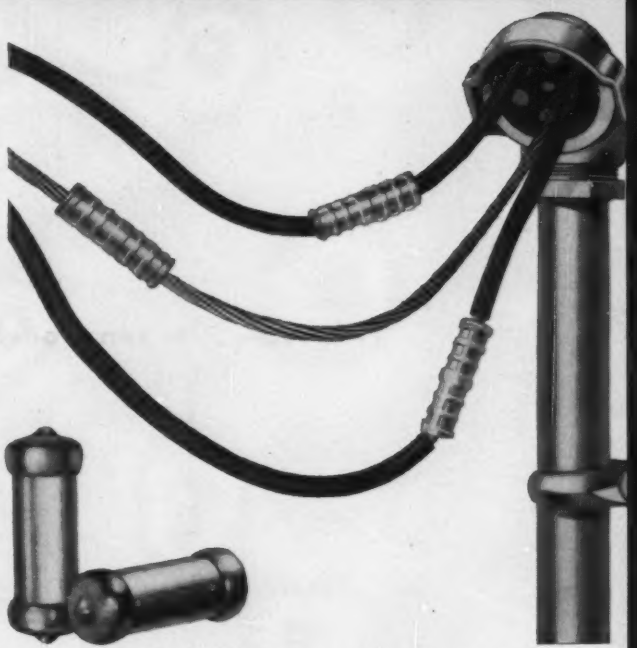
*Exclusive built-in spacers separate conductors, eliminate strand-cutting and contact surface corrosion.

Individual form-fitting grooves assure distortionless seating of conductors.

Wrap-around groove jaws provide full-circumference contact with each conductor.

You're sure of tight, neat connections with Serv-Ens . . . the outstanding compression sleeve splicing development for service entrances!

Integral, solid metal barrier between conductors provides individual connector sockets. When the wire is inserted into the Squeezon, the force against the barrier causes the Kearnalex in the sleeve bore to flow backwards and completely surround the conductor.



Sizes available for all conductor combinations. Plastic end caps are color-coded for quick size identification.

Speed work with KEARNEY Tools and Compression Fittings

JAMES R. KEARNEY CORPORATION *General Offices:* 4224-42 Clayton Ave. • St. Louis 10, Mo.

-347

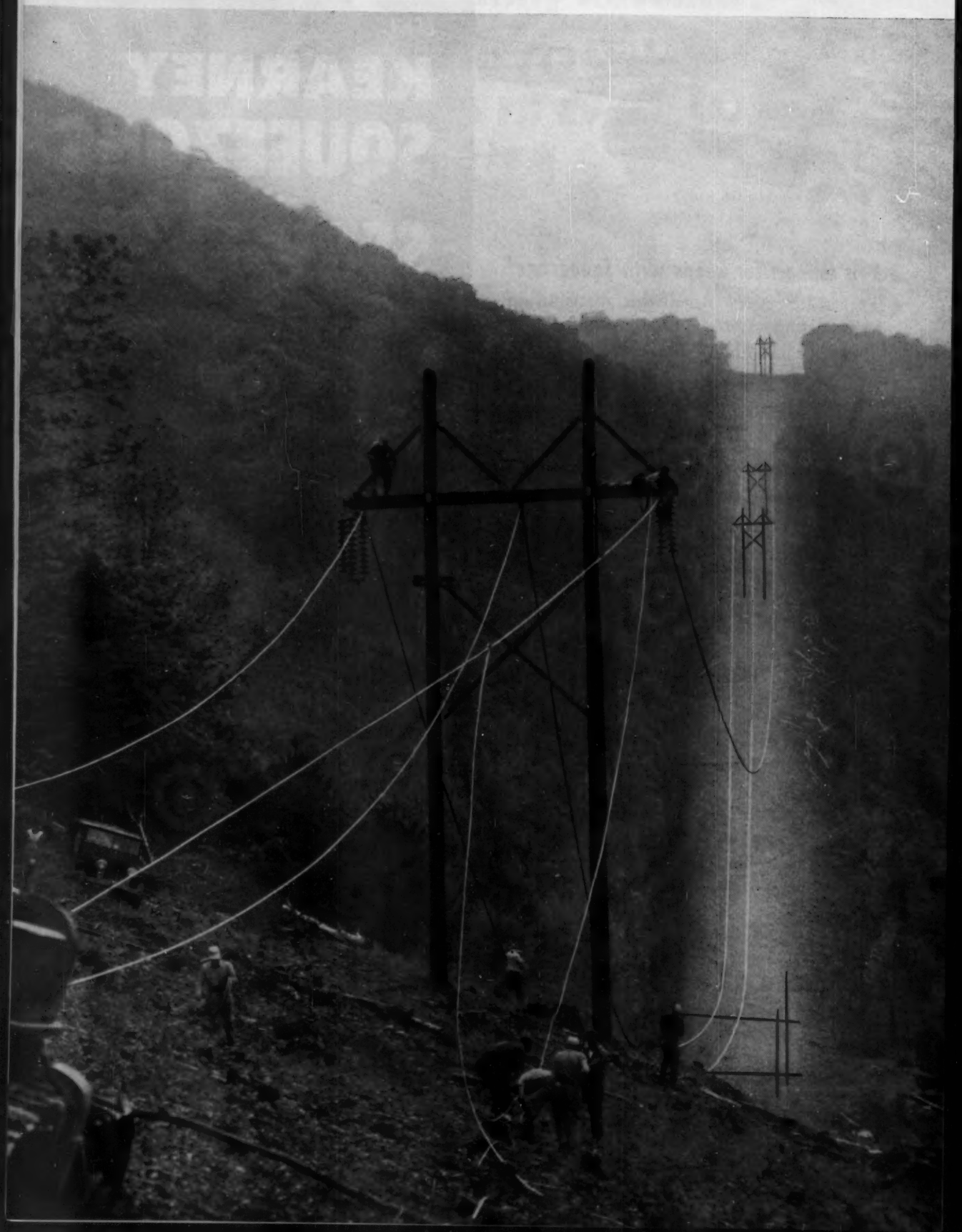
for BETTER CONSTRUCTION
SAFER MAINTENANCE

Specify JAMES R. KEARNEY ... *The Mark of Quality*

KEARNEY PRODUCTS

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA

When a job calls for ACSR... it calls for Anaconda



cable experience

Producing top quality transmission cable requires more than a ready supply of metal—copper or aluminum. The most vital ingredient of good cable is the manufacturer's *cable experience.*

The choice of metals may change, depending on economic or other considerations. But cable requirements and the skills and knowledge involved in making dependable transmission lines do not. Whether copper or aluminum . . . it will pay you to call on the Man from Anaconda.

Backed by the broadest line of wire and cable in the industry, in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs.

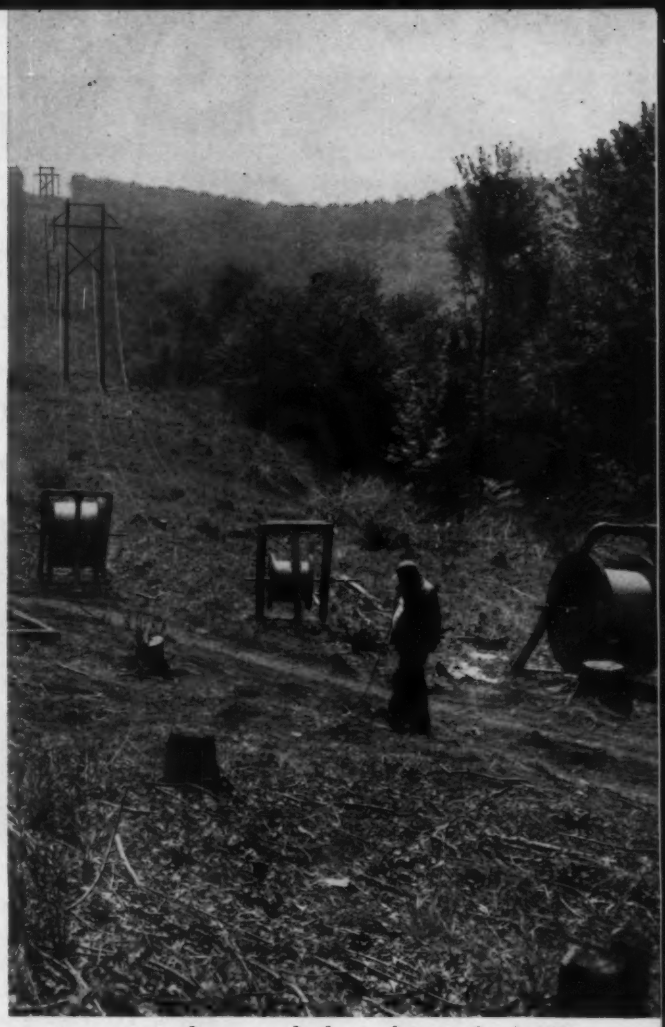
Multi-mill manufacturing facilities – strategically located across the country – assure speedy service. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

P. S. TECHNICAL ASSISTANCE. Anaconda field engineers have worked in advisory capacity on hundreds of complex jobs. They are ready to put their experience and knowledge to work on your problem. 57306

SEE THE MAN FROM

ANACONDA®

FOR ALUMINUM WIRE AND CABLE



▲ **Lineman,** standing near slowly revolving reels of cable, uses sound powered phone to talk to cable-pulling crew about one-half mile away.

Highway for power. Anaconda 336.4 Mcm ACSR installed through rugged Catskill Mountains by New York State Electric & Gas Corporation.

Bulldozer pulls cable from 4 or 5 reels up and over 5 pole dead end and on to the next H structure. "Cat" had to let itself ▼ down mountainside by winch.

1945

THE FIRST . . . **FISHER-PIERCE PHOTOELECTRIC LIGHTING CONTROL**

. . . THE LATEST

1957

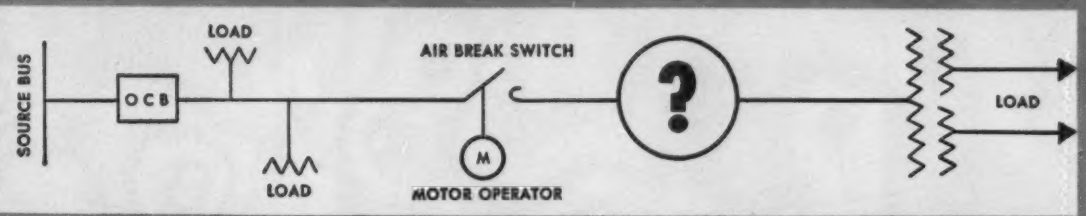
The year World War II ended, The Fisher-Pierce Company began work with utility engineers to develop photoelectric controls. Automatic, dependable switching of street lighting circuits when illumination was needed, regardless of time of day, season or weather, was the fundamental idea. The Series 61300 was the first of five different, major groups of F-P controls that have followed.

The experience has proved valuable to Fisher-Pierce and customers alike. Backed by an organization of more than 650 people, F-P today offers photoelectric lighting controls for all purposes . . . extensive sales and engineering services . . . research, development and production facilities to solve specific photoelectric/electronic equipment problems you may have. Your inquiry about F-P products, who uses them, and how you may use our development facilities for your own electronic equipment requirements, is welcomed.

THE FISHER-PIERCE CO., INC.

82 PEARL STREET, BOSTON 85, MASSACHUSETTS

HOW WOULD YOU PROTECT THIS TRANSFORMER ?



SOUTHERN STATES TYPE HRS SAVES COST OF EXPENSIVE OIL CIRCUIT BREAKER

The problem presented in the schematic diagram above is to provide adequate internal fault protection for a power transformer. One solution would be to install a high side oil circuit breaker. However, this represents a large capital outlay—and, under many conditions, might not be justifiable.

The most practical solution would be to use the source breaker to clear the line should a damaging fault condition develop in the transformer; however, in the above case, transformer impedance is great enough to limit current to values below trip settings for the source breaker relays.

The answer is to install Southern States Type HRS Automatic High Speed Short Circuiting Switch. As soon as such a fault condition develops, the Type HRS, tripped by differential relays, imposes a deliberate ground fault on the line. The source breaker opens, clears the line, and the transformer is protected.

In order to isolate the transformer from the feeder, it is customary to install an air switch on the feeder between the short circuiting switch and the source breaker. Service continuity on the remainder of the feeder, after the HRS operates, can be maintained by providing the air switch with a spring or motor operator. Suitable under-voltage timing relays will automatically open the air switch before the first delayed reclosure. Service is then restored to the remainder of the line.

For a low capital investment and reliable protection, choose the Type HRS. Complete details are available in Bulletin 55 HRS.

Available in Voltage Ratings of 34.5 KV through 161 KV and momentary current ratings of 20,000 amperes and a 4-second rating of 12,600 amperes.

55 SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

Southwire means service

Fast, dependable Southwire trucks speed the wide variety of Southwire products all over the country—from El Paso to Scranton, from Duluth to Key West—wherever aluminum or copper transmission or distribution conductor is needed.

Many of Southwire's trucks are on regularly scheduled runs, reaching every nook and cranny in an ever-increasing area. This means that shipments reach their destination *on time* and in less time than normally expected.

Add the flexibility of Southwire's manufacturing schedules to speedy shipping and you have service with a capital S. You also have the reasons why more and more engineers and purchasing agents are specifying Southwire, and why it will pay you to do likewise.

SOUTHWIRE PRODUCTS

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene Weatherproof Copper, Aluminum and Triplex
- Polyethylene Weatherproof Copper, Aluminum and Triplex
- Southwire Vinyl Weatherproof Copper, Aluminum and Triplex
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

Southwire Company

Telephone: TErrace 2-6311 • Carrollton, Georgia

KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman Electric Co. representative, and are the first one to notify Dept. SA-1, Kuhlman Electric Co., Bay City, Mich., you will receive a valuable gift certificate. Watch for the next Kuhlman "Salesman of the Week."

"WHEN I SAY KUHLMAN CLEARVUE TRANSFORMERS INVITE YOUR INSPECTION . . . .

. . . I simply mean that just one look inside a Kuhlman clearvue transformer invites easy, fast, thorough inspection. The interior is so white and clean. The oil is crystal clear. Every component from the top oil to the tank bottom is sharply visible.

"With such ideal working conditions, all inspections, adjustments and reconnections can be made right on the pole without transformer removal.

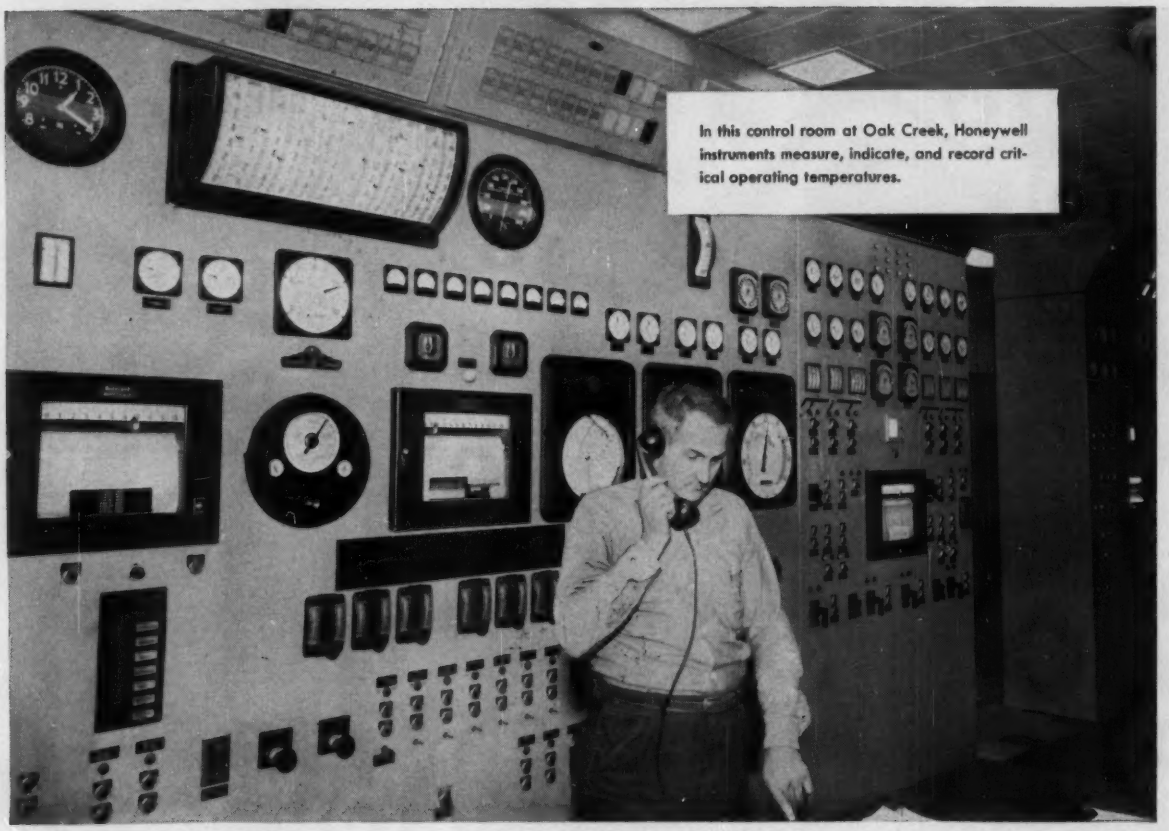
"Frankly, it amazes me that Kuhlman offers this exclusive feature at no extra cost. For, in addition to being white, clearvue is processed by the most modern dual-flow paint system known today—the very same as used for exterior finishes. You just cannot buy a more durable interior.

"Clearvue is only one of the many refinements that prove the extra-quality and extra-workmanship in Kuhlman distribution transformers. Make the Kuhlman clearvue inspection yourself and you'll see what I mean."

KUHLMAN ELECTRIC COMPANY

5711b

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA



In this control room at Oak Creek, Honeywell instruments measure, indicate, and record critical operating temperatures.

Wisconsin Electric's newest power plant

has HONEYWELL *Instrumentation to help harness 500,000 KW*

Located on Lake Michigan south of Milwaukee, Oak Creek Power Plant is Wisconsin Electric Power Company's newest, most modern station. Three units now in operation and a fourth under construction will bring the plant's total capacity to 500,000 KW. Additional future units are being planned at this location.

As in other outstanding power plants across the nation, Honeywell instrumentation figures prominently in the overall efficiency of Oak Creek. These accurate controls bring extra economy to the transformation of coal into kilowatts. Here, as in every Honeywell installation, service from the world's largest maker of automatic controls is close at hand for periodic maintenance and fast assistance in emergencies.

For experienced service in meeting your own instrumentation needs, call your nearby Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

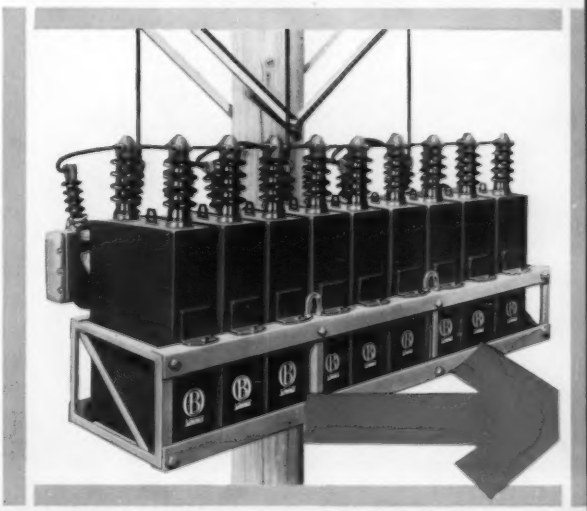
MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Here it is....

VAREX

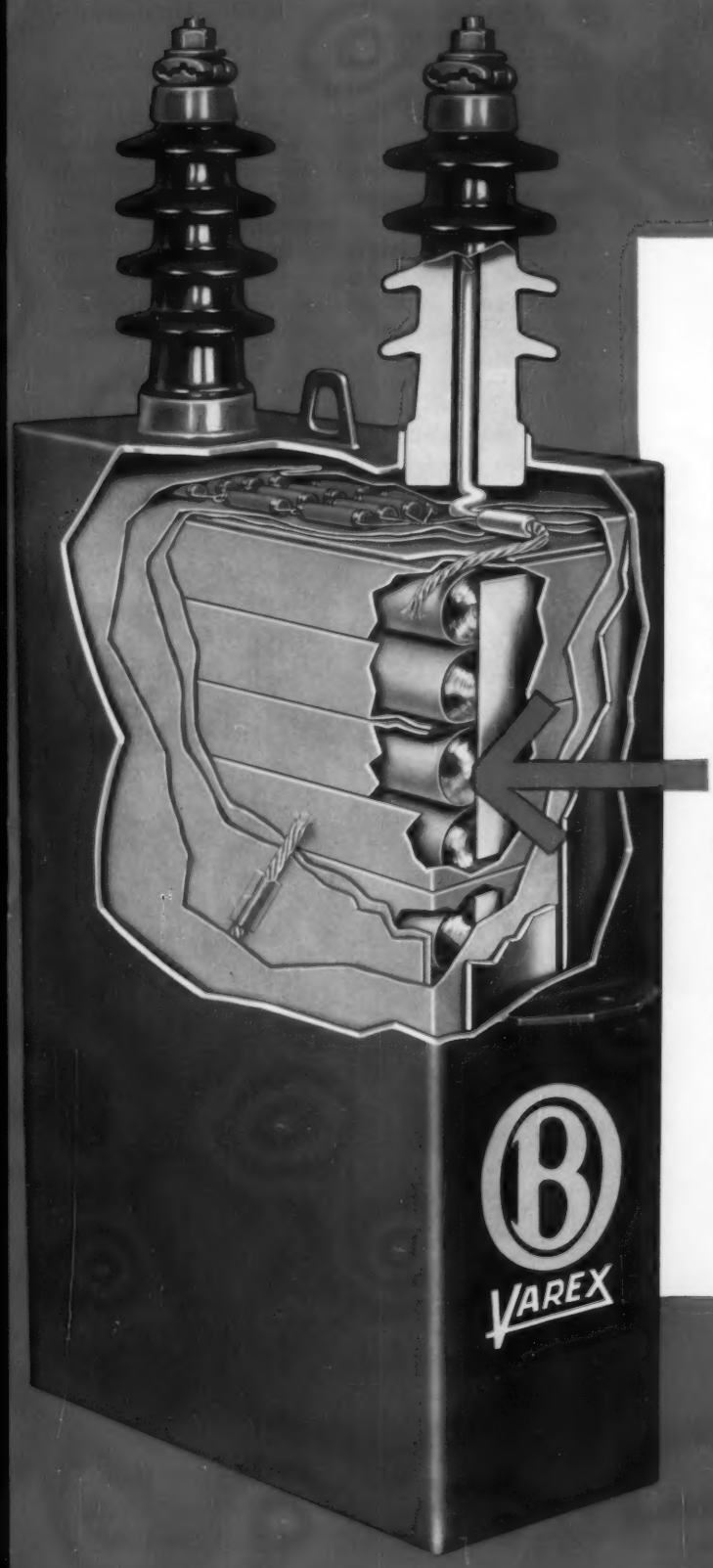
the New Ohio Brass Capacitor for Power Factor Correction.

Cool on the Inside
Low on the Outside



VAREX

offers everything you want in a shunt capacitor



VAREX . . .
A New Product

Now Available for Service on Your Lines

The Varex design has all the desirable features that can be practically and economically built into a power-factor correction capacitor. It meets all national standards for dimensions and performance, including those of NEMA.

Varex is cool . . . foil cooling assures efficient dissipation of heat.

Stocks of Varex capacitors are now being prepared for filling orders. Your O-B District Manager is eager to discuss this new product with you.

We're proud to present VAREX — the cool and low capacitor — for your consideration in filling power factor correction needs.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4750-H

BEHIND VAREX

A Generation of Capacitor Experience

Behind the Varex design are four years of concentrated developmental work in Ohio Brass laboratories and factories.

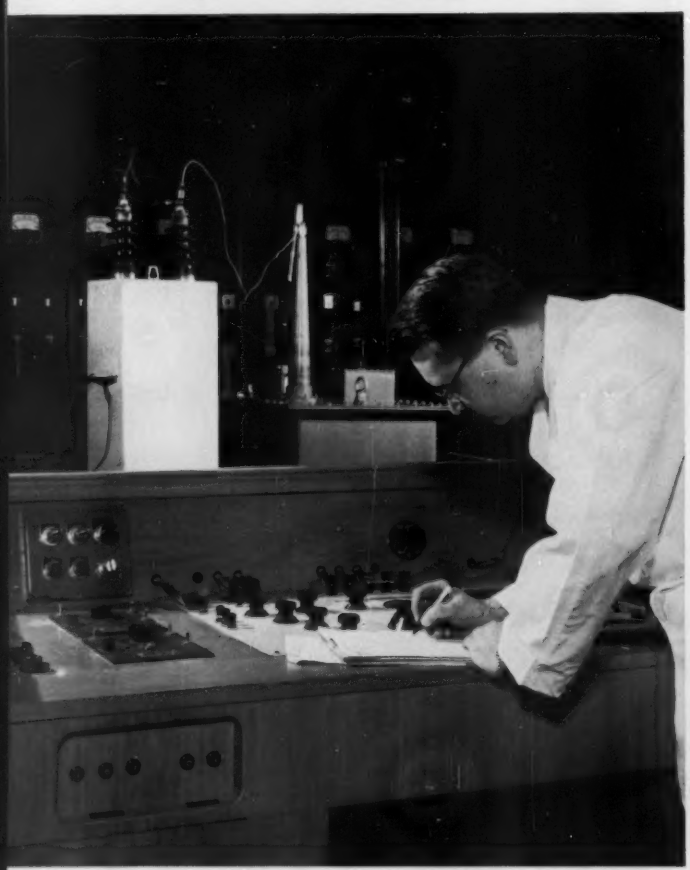
But before development engineering began, O-B obtained from ASEA (Swedish General Electric Company) rights to use its patents. ASEA has more than a generation of experience in capacitor design and manufacture. Its assistance gave O-B engineers a running start in developing VAREX. Also extremely helpful were the O-B high voltage laboratory where exploring new electrical frontiers is an everyday occurrence, and the wealth of experience gained during development of such materials as O-B Thorex lightning arresters and condenser-type bushings.

Ohio Brass and Varex are new names in the capacitor field. But behind them are many years of experience in designing and making capacitors and a great wealth of experience in making other high voltage material. In the Varex capacitor, you get the full benefit of all this experience.

Ohio Brass

OHIO BRASS COMPANY, MANSFIELD, OHIO

Here is one of many facilities developed for testing Varex capacitors. Every Varex unit gets five final electrical tests.



EDITORIALS

Three Views on Atomic Progress

"Is the pace of atomic expansion and development today too rapid for sound, scientific evaluation?

We asked this question, recently, of three men: a power plant specialist, an advanced nuclear engineer, and a pure scientist. Each answered in a manner that reflected the experience, the conservatism, and the sophistication of his profession. Taken together the replies represent a significant evaluation of a question that deserves the thoughtful examination of all concerned with developing atomic power.

The power plant specialist replied this way:

"If you have an economic, political, or other demand for large plants, the only thing to do is go ahead and build them. Historically, power plants have been built on the knowledge we already have without making too big a jump—being conservative but not slow. Supercritical steam plants are an example—they are being built today, even though there was not too much laboratory research done on them. We learn as much or more from building as from pure research."

Our advanced nuclear engineer's answer was this:

"I do not think anybody in the industry believes that current atomic expansion is too rapid. Some proposals for acceleration of today's program present a certain danger, for a program which calls for large plants to be completed five years from now requires designs to be frozen in about 18 months. This is too short a time for developing and proving advances in technology.

"A somewhat longer time schedule would enable the new plants to incorporate greater innovations and would allow the results of the first generation plants to be taken into account. It might well be desirable to build certain reactor types on a short schedule, but an inflexible rule to this effect would hinder progress on other reactors and would represent a danger to overall progress."

The pure scientist said this:

"The best science is done by a measured and relatively unhurried approach, with a few of the right people involved and permitted to make this approach.

"We seldom do the best science any more in this country. What we do is hurried, and there are too many people. Between the hurry and the people, the ones who could do this important work aren't given time; and if they are, their comings and goings would be so cluttered with people they would be distracted.

"So we try to do by brute force and mobs what might be accomplished with less expense and perhaps as quickly by an unhurried approach.

"Considered, step-by-step progress, going from small to large, is not in the picture. Political considerations override scientific considerations. The pressure for the grand approach is too great.

"I do not think we can do anything about it but get on the bandwagon and go along with it, snatching such science as we can and plowing it back into new designs as best we can."

The Trinity Project—Partnership vs Partiality

Pacific Gas & Electric Company's proposal to participate with the Bureau of Reclamation in developing power phases of the Trinity River Project, has culminated in a proposal to Congress by Interior Secretary Seaton. In his proposal the benefits of power partnership policy to the federal government and to the people of California are crystal clear. Seaton's report shows that:

- With partnership development of Trinity the need for federal funds will be cut $56 million, the amount PG&E will invest in 384 Mw of power facilities.
- Over 50 years the U. S. Treasury will net $248 million in additional revenues and taxes. Of this, the Treasury will net $165 million more in falling water payments and savings in annual cost than it would receive in power payments if Reclamation built the whole project. The remaining $83 million would be PG&E's federal taxes.
- Local and state taxes for the 50-year period would be $62 million.

This brings the total of all taxes plus net falling water revenues to $310 million for 50 years.

In contrast, full federal development of the Trinity River Project would require $56 million more in federal funds, plus annual interest and depreciation charges, to insure power savings of $47 million to non-federal preference customers over a 50-year period.

There seems to be no sound reason why the federal government and the people of California should lose $310 million in revenues to provide a saving of $47 million for preference power customers in the Central Valley.

Who Says There's No Competition?

- In New Mexico a rural co-op protests PSC order granting company rights to serve big cement plant—if and when it's built
- In Arkansas a court fight is brewing over a 'territory freeze' law because two senators allegedly voted in absentia
- In Indiana a trial begins this week involving wholesale power resold by REMC's to customers with loads over 250-kw

"But you folks in the utility business don't have to contend with competition." That's an idea often expressed by your friends in other industries. They know that most utilities are regulated by state or federal commissions, but still they seldom note the sporadic fights for business among the various segments of the industry.

But if anybody doubts that there's still a healthy spirit of competition within the industry, they can take a look this week at some pretty sprightly squabbles in several different geographical areas:

In New Mexico, for instance, service to a cement plant that hasn't yet reached final planning stages is the field for a rhubarb between Public Service Co of New Mexico and Socorro Rural Electric Cooperative.

It happened like this: Permanente Cement Co, one of the West's largest producers, chose a Scholle, N. M., area as a site for its $10-million plant. Land has been purchased and plans drawn but no go-ahead on construction has been ordered. The site is in the co-op's service area, 25 miles from PS lines.

After getting estimates from the protagonists, Permanente sent a letter of intent to the Public Service Commission. It stated Public Service Co's bid was preferred. PS applied for a convenience and necessity certificate which was granted by the PSC March 8.

Meanwhile the Socorro co-op objected on grounds it could serve the 5,600-kw load, the PS application would bring duplications of facilities, and Permanente's intent was discriminatory.

One offshoot came at National Rural Electric Cooperative Assn's meeting. During the voting on resolutions R. B. Moore of Lovington introduced a measure from the floor. It took aim, not at Permanente but Kaiser Industries, Inc, which owns stock in the cement company.

The resolution stated "this annual meeting deplores and condemns the attitude of a parent corporation controlling two subsidiary companies . . . in allowing one (Kaiser Aluminum Corp) to cultivate cooperatives in the sale of its products . . . while its sister subsidiary (Permanente) discriminates against an electric cooperative in the purchase of that subsidiary's power requirements."

A Kaiser Industries spokesman discounted the "parent corporation" stigma. "Both Kaiser Aluminum and Permanente are independent companies," he said. "Kaiser Industries owns 37% of the aluminum firm and 29% of Permanente, but they operate in complete autonomy."

He added that both firms have their own boards of directors, and determine their own policies.

W. A. Marsh, Permanente president, indicated the issue isn't as crucial as the resolution would make it. "It hasn't been finally decided yet on whether the plant will be built or not," he stated. "It will require further study."

And, as for negotiations on service, "Public Service came up with a proposition more economical than the cooperative," Marsh added.

Service to some industrial loads is also apt to be the stake in an Arkansas donnybrook. The state legislature enacted a "territory freeze" law earlier this year. Effective July 1, it enables co-ops to retain service areas even when annexed by a city.

But the legality of the state Senate's vote on the measure will be challenged. The bill passed by a minimum 18-13 margin. Sen Ellis Fagin of Pulaski County says two of the voting Solons were not on the floor at the time. The two men had arranged a "pair" vote; one was voting "aye," the other "nay." This procedure requires one of the pair to be present to cast both votes. Since neither was on hand, Fagin says he will challenge the measure in court.

The "freeze" act will supersede a law which provides co-ops with reciprocal compensation when displaced by an annexation. A wrangle

in eastern Arkansas is currently involving a co-op, a municipal system, and an electric company on how to interpret the present law.

Forest City, which owns its own system and leases it to Arkansas Power & Light Co, has annexed a new area. The territory is served by Woodruff Electric Cooperative Corp, which says it is willing and able to continue serving its customers, including a $4-million hoist machinery plant slated for construction there. The incoming plant, though, has contracted with AP&L, as lessee, to supply the 1,000-kw load. In reply, the co-op has asked the PSC to order the power company either to relinquish comparable territory or pay for loss of the customer plus "prospective growth of the area."

But a joint answer by AP&L and the city council takes this position: There is no territory in dispute between the power company and the co-op. The city, while not subject to the reciprocity act, has proposed a trade of customers of equal or more value than the co-op has in the new area. And the co-op offer to continue service is contrary to the purpose of serving farms, ranches, and towns under 2,500 population not getting central station service.

In Indiana, a commission ruling which co-ops say would hamper their service to large power users is being appealed. According to Rural Electric Membership Cooperative spokesmen, the order was signed late last year by two "lame duck" commissioners who were replaced a month later when Gov H. W. Handley (Rep) took office.

A trial beginning this week in the Hendricks County Circuit Court will decide whether an REMC brief for a permanent injunction against the order should be granted.

The point of origin was in a supplemental order based on Public Service Co of Indiana's request for a rate increase. In the company's schedule no income allocation was set for wholesale power purchased by REMC's. Protestants at the hearing said REMC exclusion would work a hardship. The PSC consequently ordered a 5.35% rate increase on sales to co-ops. The order also said that for wholesale power resold to customers with over 250-kw demand, Public Service charges could be equal to its "primary power and light" schedule for commercial and industrial customers.

The reason no rate hike for REMC's was included in the PS request was the existence of a statewide co-op rate applicable to all companies selling wholesale power.

REMC's will take the battle to the U. S. Supreme Court, spokesmen say, "to defend our rights to serve all inhabitants of our service areas." Their argument is based on a 1935 act assigning protected franchise territories to REMC's which, they claim, entitles them to serve all inhabitants, including industries. And they also contend the PSC order, as it affects REMC's is "arbitrary, illegal" and, in effect, a legislative decision.

Currently Public Service Co is applying the rate as ordered by the commission. Other companies are holding back, presumably until the Circuit Court decision is reached.

PUC Turns Down Central Maine Rate Boost

Disallows fast depreciation tax benefits for rate-making purposes, hits at losses in appliance merchandising, and would limit promotion spending

A $2.3 million rate increase, proposed by the Central Maine Power Co, has been denied by the Maine Public Utilities Commission. It had been calculated to return about $1,757,000 a year in new revenue immediately and $564,000 more gradually over a period of years.

In a letter to shareholders, Pres W. F. Wyman of Central Maine said the decision "in effect represents to a considerable extent a refusal on its part to go along with its previous position." He noted specifically that the Commission in 1953 had found a 5.8% return on the rate base to be reasonable, but in the recent decision had reduced the rate to 5.61%. This was done, said Wyman, "in spite of good reasons why the rate of return under today's conditions should not be less and might well be higher than the 5.8% allowed by them in our previous case."

On the basis of information developed during eight months of public hearings between July and December 1956, the Commission held that the company's net operating income of $10,064,075 a year is "more than fair and reasonable on the basis of the evidence before us . . ."

PUC Says 5.61% Return Is Ample

The Commission said the net operating adjusted income of $10,064,075 yields a return of 5.61% on a rate base of $179,250,000, or 6% on average net plant investment of the company's operating property in service.

PUC disallowed the company's proposal to use one method of computing depreciation of new operating property for actual income taxes and another method, resulting in a higher theoretical tax, for rate making purposes. This involves the relatively new 1954 federal tax permitting accelerated depreciation for tax purposes.

Nothing was allowed in computing the net operating income to cover the company's losses of over $200,000 a year in merchandising. "The company has the right to carry on such a department with such a loss," the order said, "but it cannot expect that loss to be made good via a higher than required rate of return."

PUC also excluded from expenses a gross amount of $166,700 ($80,000 net) of the $297,600 the company proposed to add to operating expenses charged to sale promotion. Some promotion is necessary, the PUC said, particularly in connection with new types of special industrial equipment. But other items, such as institution advertising and "good will" programs, should not burden the ratepayer, the order said.

Pipeline Gets Unplugged

The 108-mile coal pipeline from Pittsburgh Consolidation Coal Co's strip mine at Georgetown, Ohio, to Cleveland Electric Illuminating Co's Eastlake plant is now unplugged. James Hyslop, president of Hanna Coal Co, which operates the line, said an improper size mixture of the 400-ton test batch of coal caused the stoppage. Many oversize pieces were found in the slurry. It was discovered later that these pieces entered because of a mechanical failure in the screening equipment.

Now the line again is being tested with water. A series of slurry tests soon will be resumed—and are to take "considerable time." Hyslop indicated the plug was not unusual—that similar difficulties had been encountered in operating a short pilot line. He said there's likely to be more trouble before testing is finished.

AEP 'Seeds' Houses

Appalachian Electric Power Co, with help of manufacturers, distributors and dealers, has started a drive to spread electric heat through the utility's service area. The territory has been divided into 800 sections. Object is to get one house converted per section—with discounts in equipment and installation costs. The selected customer must agree, however, to hold open house at least three times a year with AEP help, and to permit prospects to be brought to his home for demonstration for the first year. Idea is that one successful installation in an area will breed others.

Lots for the Ocelot

An ocelot is a meat-eating wildcat which ranges from Texas to Patagonia—one of which in particular occupies a basement room next to the electric meter in a house visited by Pacific Power & Light Co meter readers Bob Houtz and Roy Hays. It is a monthly ritual now for the two meter readers to draw lots to see who reads the meter and faces the ocelot. The latter is 30 in. long and stands 14 in. high.

Co-op Gets Nuclear Loan

The Rural Electrification Administration has approved its second loan to a co-op for use in a nuclear power project. The $3.2-million loan went to the Wolverine Electric Co-op of Big Rapids, Mich. The loan specifically provides for construction of two 5,000-kw steam generating units at the Hersey plant. But it is anticipated that a conventional boiler will not be built for this project if Wolverine's negotiations with Atomic Energy Commission for construction of an aqueous homogeneous reactor are successful.

No More Legal Blocks

Federal power interests last week exhausted their legal channels for blocking construction by Idaho Power Co of three dams on the Hells Canyon region of the Snake River.

The legal curtain rang down on the National Hells Canyon Assn—spearheading the fight by a number of public power organizations to halt IPC in the courts—when the Supreme Court refused to review an appeal by the Association from a ruling against it last October by the U. S. Court of Appeals.

The lower court had affirmed the action of the Federal Power Commission in issuing a license to IPC in 1955 for three dams. The National Hells Canyon Assn had sought to stop IPC in hopes that Congress would pass legislation calling for a single high federal dam at Hells Canyon.

Congress again this year has bills calling for the high dam by Sen Wayne Morse (D-Ore.) and others. Chances of passage of such legislation are not considered any better this year than last, when the measure was defeated in the Senate.

The National Hells Canyon Assn wanted the hearings reopened to introduce new material in the record. The material consisted of Interior Secretary Fred Seaton's letter to FPC regarding the study he ordered of the Pleasant Valley Site. But in a letter to the Senate Interior Committee, Seaton reiterated his opposition to a high Hells Canyon Dam and said the three small dams should be allowed to be completed as scheduled.

Air-Conditioned Schools

The Air-Conditioning and Refrigeration Institute has recommended that the National Conference of Governors, meeting June 23-26 in Williamsburg, Va., study air-conditioning of the nation's schoolrooms. The objective is to permit year 'round use of classrooms to help meet the shortage of space.

Lake Building—for Steam

Public Service Co of Oklahoma is slated to complete by June a lake that will provide water for its Washita steam plant during dry periods. The lake is being hollowed out on Leaper Creek, 2½ miles northeast of the plant. When completed, it will be 2½ miles long and ¾ mile wide. The dam will be 500 ft wide at its bottom and 80 ft high. During flood season, water will be pumped into the lake.

Meet Ted Wolfe: New President, Baltimore G&E

From house painting to utility head, his credo has been "apply the golden rule"

On the afternoon of Friday, March 22, the board of directors elected J. Theodore Wolfe president of Baltimore Gas & Electric Co. Less than 24 hours later, he and three associates were celebrating on the golf course. He shot his best game.

"But one of 'em beat me," said Wolfe.

"I'm trying to get him a job on the B&O now.

"Just shows what respect these guys have for their new president."

But Ted Wolfe is a modest man. The respect he disclaims is inundated by waves of testimonials poured out by his associates.

"Can't find a finer man in the industry," said one. "His office door stays open to all employees," said another. "There's not a person in Baltimore who'd say a word against him," volunteered a secretary.

Reaches Top at Age of 48

At 48 years of age, with 20 years ahead before compulsory retirement, Ted Wolfe is what might be termed a self-made man, although he would recoil at that nomenclature. He's an integrated combination of the Presbyterian faith, his family, and his associates. He credits his success to almost anyone or anything but himself. Example: "I just happened to be in places where things were going on, and one thing led to another."

Ted Wolfe did not become president merely because he got the "breaks." The road he has walked would dismay men of faint heart.

As a high school graduate, he helped his father. They painted houses. His pay was "nothin'." Even though the depression had not yet paralyzed America's economy, there was little money left over after the other men had been paid. And in Ted Wolfe's life, the other man always comes first. He considered himself fortunate when his father handed him $8.00 for a day's work.

Majored in Economics and English

After housepainting a year, he tackled the commerce and finance curriculum at Penn State University. He majored in economics, but also accumulated enough credits for an English major, too. ("I just can't emphasize strongly enough how important it is for a man to be able to express himself.") On the side, he captained Penn State's tennis team.

Accepting scholarships and help from a friend, he pursued business administration at Harvard University Graduate School. The curriculum called for him to work somewhere in business during the summer following his first year of classes.

He was placed at Baltimore Gas & Electric, then called, Consolidated Gas, Electric Light & Power Co of Baltimore. His summer bosses liked him. They invited him to come back when he finished graduate school.

Took Job Because It Was 'Available'

The stock market crashed, meanwhile, and Ted Wolfe and classmates left Harvard in 1932 facing bleak years. Wolfe accepted BG&E's standing invitation because "it was the only job in the United States that was available" to him.

He worked six months in the accounting service department, then was transfered to a staff position in the executive offices. This indefinable job called for many talents—from ability to set up a budget control system, to skill at wrapping a neat package for mailing.

Fourteen years later, in 1942, he was elected assistant vice-president. In four more years, he was named vice-president. By 1950 he was made executive vice-president and a company director.

Since then, he has further expanded himself—now being a director of Black & Decker Mfg Co, Maryland Casualty Co, Maryland Trust Co, Provident Savings Bank, and American Gas Assn.

Now, having reached the top, Wolfe would offer this advice to any man who wants to get ahead: do the best you can at whatever job you have. Broaden your knowledge of the business. Acquaint yourself with the objectives and problems of the business. Never stop trying to learn more. And above all, apply the golden rule.

Ted Wolfe especially works on that golden rule aspect. He confesses that his interests center about

people primarily, business secondarily.

"Business activity should relate people one to another in such a way that their lives are more abundant. The business is not worthwhile unless it does this."

To Ted Wolfe, the most fascinating aspect of the electric utility business is its important role in the lives of "so many people." In Baltimore, for instance, 1,650,000 people enjoy electric service. In addition, 35,000 stockholders and 8,000 employees and their families benefit directly by BG&E's existence.

To him the most fascinating aspect of being president is the decision-making. He thrives on it, and never feels the need to "get away from it all."

When he does slip away, it's on a vacation. He prefers to read historical novels—with a few "whodunnits" thrown in for good measure. His reading time otherwise is cramped: he carries on many civic and charity activities.

Moved Not to Suburbs, but Closer to Office

Neither Wolfe's background nor his executive success has forced him into what might be thought of as the "typical executive pattern." While others fled to Baltimore suburbs, Wolfe—despite his early life in Leetsdale, a small western Pennsylvania community—moved deeper into town. He got closer to the office.

This sandy-haired father of two children (a 15-year-old boy and a 12-year-old girl) otherwise leads a fairly normal life. He rises at 7 AM, drives to work, eats "anything that's available"—accompanied preferably by buttermilk, and raids the refrigerator for ripe cheese before going to bed at 11 PM. On the golf course, he shoots 81, "plus or minus three strokes."

He stands 5 ft 11 in. tall, weighs "too much," smokes a pipe, follows politics, and believes with conviction that the single aspect of the electric utility business which needs the most attention is this: the persistent effort of "certain elements and groups to inject the federal government into the utility field."

The second most-urgent problem needing a national solution, he feels, is that of providing good electric service at lower cost. He suspects costs could be cut in distribution methods and equipment. "It's a funny thing," pointed out an associate. "In our business, it costs twice as much to wrap and deliver the product as to make it."

Wolfe also believes operating expenses somehow might be cut by working over the cumbersome machinery of billing and collecting.

BG&E: A Prosperous, Progressive Company

Against a prosperous economy of diversified business in this coastal port, BG&E's rate of growth is above average for companies in the area. This year BG&E expects to add 16,224 customers, a 3% growth.

BG&E is participating in Atomic Power Development Associates, a research and development group of 34 utilities and manufacturing companies. But BG&E has no immediate plans for building an atomic power plant alone.

In another field, BG&E is going after better protection against lightning. Line crews now are installing those mysterious Cougnard deionizers (EW, March 11, p 85) on all three phases of a 40.5-mile, 33-kv line.

"Our company has been one of the leaders in developing lightning protection," said Wolfe in his soft, unimposing voice.

BG&E also points to its efforts at helping to develop techniques in producing better cable splices and potheads. Years ago, BG&E engineers even designed their own potheads. Now they boast a low failure rate.

These, among others, are Baltimore Gas & Electric's answer for those who are interested in the company's "progressiveness." And this is the company Ted Wolfe now heads.

Associates sum up Wolfe's management ability: "He's the sort of guy who'll come to you and start talking over an idea," they explain. "By the time he's through, you're convinced the idea is yours. And brother, that's good management."

ATOMIC PROGRESS

AEC will chemically process fuel elements of Power Reactor Development Co's proposed fast breeder reactor, although PRDC will bear costs, under terms of recently signed pact (EW, Apr. 1, p 19). Under pact, PRDC may cancel contract if satisfactory liability insurance is not obtainable.

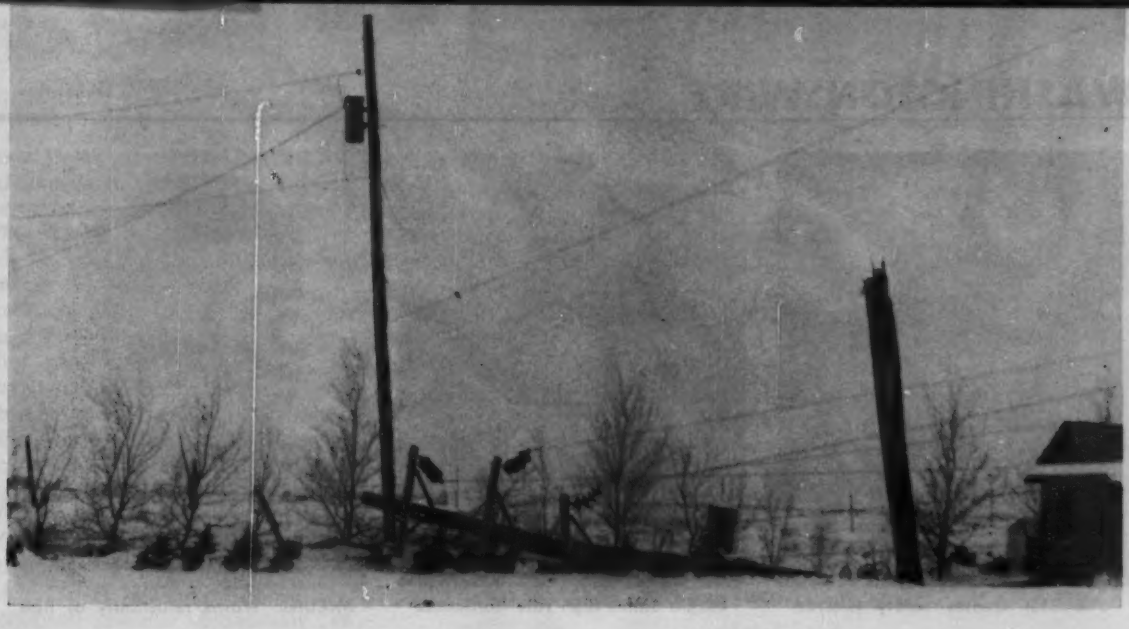
New power reactor concept, which would use flowing solid particles for nuclear fuels, will soon be tested under research and development contract awarded by AEC to Fluor Corp, Ltd. The new system, for which special forms of uranium and thorium will be tested, is believed to be more economical, require less fuel enrichment, operate at higher temperatures and lower reactor pressures and involve less corrosion.

Recently formed Central Utilities Atomic Power Associates have filed articles of incorporation with Minnesota secretary of state. Northern States Power and nine other utilities formed CUAPA to build the 60,000-kw, $20 to $25-million atomic power plant for 1962 operation.

Standard nuclear instrumentation will be adopted within five years, predicts William J. Ladniak, manager of operations, Daystrom Nuclear Division. First to be standardized will be reactor control instruments, chemical processing where associated with nuclear reactors, and health physics instruments, he said.

Winner of construction contract for Carolinas-Virginia Nuclear Power Associates proposed nuclear power electric generating plant is General Nuclear Engineering Corp of Dunedin, Fla.

AEC has ended its contract to sell power to Niagara Mohawk Power Corp from its experimental 10,000-kw reactor at West Milton, N. Y.



Blizzard Lashes Midwest Utilities

Five-day storm wreaks havoc as lines freeze, poles topple, and deep drifts prevent repair efforts; damages are estimated in the millions of dollars

Storm-plagued utilities had barely started repairing the havoc of spring snow and ice late last month when new troubles loomed. Midwest, Southwest, and Rocky Mountain states were hit with more paralyzing snow and cold.

This followed practically upon the heels of a record-breaking blizzard which paralyzed the Midwest March 23-27 caused millions of dollars in damage to utilities and provided electric service companies some of their worst headaches in many years as winds, snow, and ice broke poles and cut off power. In many sections the severe weather conditions hampered the efforts of repair crews for days.

Nebraska suffered damages to its power and telephone facilities—estimates placed losses at well over $50,000. But the storm seemed to concentrate its fury farther south, in central Kansas (see cut).

REA lines in Kansas bore the brunt of the destructive storm. Jack D. Goodman, manager of Central Kansas Electric Cooperative Assn, which serves farm families in 8 counties, says the whole system was destroyed. Six to 8 inches of wet snow, which froze on the lines, was followed by 50-60 Mph winds. Some 15,000 to 20,000 poles went down, and damage is estimated at $1,500,000. Goodman says service can be restored in four to six weeks, provided poles can be obtained.

Other REA systems in Kansas which were heavily damaged were those at Pratt and Wakeeney, which had whole sections destroyed.

Urban utilities in this area suffered disrupted service because of broken lines, but seem to have lost few poles.

At Dodge City (Kans.) Victory Electric Cooperative Assn reported broken lines, but no downed poles. Some areas served by the system were without electricity for four days. W. L. Current, manager, said 7 to 10-ft snow drifts made it impossible to locate breaks in the wire until the Army loaned him a helicopter to inspect lines and fly supplies to marooned crews. During and after the blizzard electrical milking machines and cooling tanks could not be used.

Southwestern Public Service Co, which serves the Oklahoma and Texas panhandles and eastern New Mexico, reported dollar losses were relatively light. There was no serious damage to equipment since the snow in that area was dry and there was no icing. However, broken lines interrupted service for several days in some sections.

Southwestern maintained an around-the-clock schedule for repairmen as the Amarillo (Tex.) area was hit by broken lines and connections loosened by high winds. Freezing temperatures and high winds delayed linemen in mending breaks. In many instances snow drifts prevented trucks from reaching trouble spots. Crews were marooned in power plants for two to three days. At Higgins, repair parts were flown in by helicopter.

About 480 farm families in Deaf Smith, Castro, and Parmer counties in the Texas panhandle were without electricity for several days when REA lines were broken. Dairy farms and pig and chicken brooders in the area were hard-hit by the electricity failure. Although damage to lines and poles was not severe, deep drifts prevented crews from reaching sections which were out.

In Northeastern New Mexico, where cattlemen suffered their greatest losses, extremely high winds broke poles and untied lines—disrupting service from four to five days—but dollar damage to utilities was not great.

STRAUSS: Quotes safety records

FREER: Slams high rate bottleneck

McCUNE: Warns reluctantly of halt

Need for Atom Insurance Is 'Urgent'

Witnesses at JCAE hearings stress immediate need for federal liability insurance; GE spokesman warns of possible project halt if proposed bill is not passed

Congress has heard the pleas of administration, industry, and other spokesmen on the need for federal liability insurance for nuclear projects. According to witnesses the need for such insurance is urgent if this country is to have a non-federal atomic energy industry.

The recently concluded hearings before the Joint Committee on Atomic Energy produced no opposition to a bill which would provide $500 million liability insurance over and above the $60 million private insurance industry is willing to put up. The measure, similar to one which failed to obtain Congressional action last year, is sponsored by Sen Clinton Anderson (D-N. M.) and Rep Melvin Price (D-Ill.).

Although there is unanimity of agreement on the need for such federal insurance, it may again be sacrificed to politics. There are reports that some Democratic Congressmen intend to make passage of the bill dependent upon passage of a reactor acceleration bill. This last would provide for federal construction of reactors, a move opposed in the past by both administration and industry.

The most outspoken witness to appear was General Electric Co's Vice Pres Francis McCune, who said unless the insurance measure was passed this session, he would recommend that Commonwealth Edison stop work on its Dresden nuclear power plant in which GE is participating.

McCune's forthright statement was praised by both Democratic and Republican committee members. But Anderson saw it differently.

He said, "If it now becomes so expensive between insurance rates and costs that they cannot go ahead it will be very convenient to say, if we don't pass a bill, 'you see, Congress did not pass a bill, so we had to fold up'."

McCune told JCAE that GE had been reluctant, categorically, to state it would not proceed unless an indemnity bill was passed.

"We have feared that such a statement might be misinterpreted as a threat to Congress to take action 'or else' . . . However, there comes a time for a frank statement of the position of the General Electric Co," said McCune.

"At present I see no alternative but to recommend that work on the Dresden station be halted as soon as practicable after the end of this session in case appropriate legislation has not been passed by that time. Also, it is my view that GE should not take on any other comparable project if it appears that appropriate legislation will be passed.

To date GE has spent over $21 million by way of investment and related expense, including development. In addition it had spent $6 million on the Dresden station and by mid-summer will have spent about $12.5 million on this project.

McCune Hits Limitations

McCune also criticized the proposed private insurance policy for its limitations. The policy's full $50 million face amount would not be available to pay liability claims and certain types of liability would not be covered, he said.

The policy referred to by McCune was described by Charles J. Haugh, president of Travelers Indemnity Co and Travelers Insurance Co, who represented Nuclear Energy Liability Insurance Assn.

Haugh said liability hazard among reactors may vary depending on five major criteria: type, use, size in terms of megawatts of heat, location, degree of containment.

In the light of the foregoing the charge would be determined for the

first $1 million of insurance and additional millions would be charged as percentage of the base premium. There would be a minimum charge of $1,000 per million dollars for all power reactors.

Haugh said the insurance pool had incorporated a long-term rating plan under which premiums would be reviewed and if at the end of ten years there was no substantial loss, a retroactive reduction of premium charges would be made.

These private insurance rates received their sharpest criticism from Gail Freer, personnel and insurance director, Rural Cooperative Power Association. He suggested the government consider broadening its coverage to relieve small concerns of the heavy rate burden.

Citing AEC Chairman Lewis Strauss' recital of past reactor safety, Freer said "We are completely unable to justify the insurance rates proposed to us."

His co-op had been told, he said, that in order to obtain insurance for the reactor it would have to give the insurance pool all insurance on its present plant. "This in itself eliminates competition and restricts us to pool members for all coverage.

"Next, we are quoted for physical damage a rate of 25 cents per $100 of value per year. This would be an additional $25,000 per year to our present insurance costs.

Rates Called Prohibitive

"We feel these costs are prohibitive because at the present time we are paying on this item at a rate of five cents per $100, which we would still continue to pay. The third party liability quotations are terrific."

It would cost Elk River $40,000 per year for insurance, said Freer. "We feel that $40,000 insurance costs per year for a small utility such as ours and which does not include workmen's compensation costs, which may be increased, will be a severe bottleneck in expanding atomic power and especially to small operators."

Freer said that if the proposed federal liability measure could be broadened slightly and coverage extended to all nuclear incidents or radiation hazards to both property and the contractors or licensee as well as that of the third party liability, then all insurance companies could write coverage on atomic power plants and, thus, adequate experience would be gained so that insurance companies could eventually take over the entire responsibility and ease the government out of the problem in a manner that would not expose our insurance companies to unknown risks.

Arthur A. Berard, president of National Electrical Manufacturers Assn, told of the concern felt by smaller equipment firms and companies which might provide a small item for a project.

Staggering damage could result in a nuclear accident simply from the failure of an electrical control or safety device, costing perhaps less than $50, and used in the nuclear system without the prior knowledge of the manufacturer.

Berard cited the Columbia University study on liability insurance in pointing out that "liability even without fault may be applied to the operators of atomic installations." Neither the operators nor the suppliers can be certain that in a particular case they will not be held liable, however careful they may be, he said.

Mysteries Haunt AEC Probe

The Atomic Energy Commission safety hearing on Power Reactor Development Co's nuclear power project to date has cleared up one minor mystery, raised a new one, and failed to produce any conclusive evidence that the project will be unsafe.

The minor mystery: Who is giving technical advice to the three labor unions who requested the hearing? The answer: Bernard Spinrad, assistant director of the Reactor Engineering Division at Argonne National Laboratory.

The new mystery: How three top-flight scientists can be so far apart from another group of top-flight scientists on the findings of the AEC Advisory Committee on Reactor Safeguards.

The current hearing, called at the request of the AFL-CIO auto, paper and electrical workers, stemmed originally from findings of the Safeguards Committee that insufficient information was or would be available to establish the project's safety.

Yet Dr Hans Bethe of Cornell University, Dr Norman Hilberry, director of Argonne National Labs, and Dr W. Kenneth Davis, director of AEC's Reactor Division, all disagreed with these findings.

Davis told Union Counsel Benjamin C. Sigal that any accident to the PRDC reactor "will be a very small accident indeed."

The two final witnesses for PRDC, Walter J. McCarthy, Jr, head of the nuclear engineering section, Atomic Power Development Associates, PRDC's research organization, and Alfred Amorosi, technical director of APDA, took the stand last week when the hearing resumed after a 10-day recess.

As the hearing proceeded, Sen Clinton P. Anderson (D-N.M.) former chairman of the Joint Committee on Atomic Energy, introduced a bill that would make such hearings mandatory on all future nuclear power and test reactor projects.

Anderson's bill would also give the Safeguards Committee—now merely an advisory group—more standing and require public disclosure of all their reports on future projects except where classified information was involved.

Anderson said he did not intend the measure to reflect on the ability or integrity of the AEC staff. "I simply wish to be sure they have to move where everyone can see every step they take . . . in this very important field where monopoly could so easily be possible, I think a hearing should be required and a formal record should be made regarding all aspects, including the public aspects," he said.

Anderson said he hoped to introduce another bill that would deal with AEC reorganization relative to licensing matters.

Utility Engineers Consider Ways

PCEA Engineering and Operating Section hears industry leaders report progress on solving its technical problems

Challenge of meeting future utility system demands keynoted the Pacific Cost Electrical Association Engineering and Operating Section annual conference, March 21-22, at Los Angeles. Nearly 600 PCEA members heard utility and manufacture specialists tie past experience and present practice to future problems in two full days of technical sessions.

W. L. Chadwick, vice president, Southern California Edison Co, highlighted the attack on the future by cataloging the challenges and opportunities confronting engineers and operators. He characterized the utilities' foremost problem as the reduction of overall costs, calling for automation, innovation, planning, and better apparatus. Exemplifying the bold approach required, he envisioned use of automatic computing devices for power system control and protection, tape-programming of steam plant cold start-up operations, and automatic customer metering from a central point.

R. J. Phillips, vice president, San Diego Gas & Electric Co, outlined a basic sales promotion policy for today's utilities. Selective selling is the order of the day," he emphasized. A 5% load factor improvement can up rate of return 10%, he continued, calling for incentive rates to accelerate addition of load-factor-improving loads.

How manufacturers contribute to meeting future loads was described by J. K. Dillard, manager, electric utility engineering, Westinghouse Electric Corp. Research and development takes 6¢ of the equipment dollar cost. Characterizing recent development breakthrough is the design of alloys by mathematical methods.

Industries must wake up to the fact that they cannot look to major engineering schools for "draftsmen," said Dr Fred C. Lindvall, chairman, Engineering Department, California Institute of Technology. The reason is engineering schools are moving to scientifically oriented curricula which will gird graduates to meet future engineering challenges.

Application of electronic computers in the United States is growing by a factor of ten annually, observed Dr E. L. Harder, Westinghouse, and there is every reason to believe this growth rate will continue. Transistors will reduce computer size and cooling requirements while improving reliability factors. F. J. Maginniss, General Electric Co, pointed to potential saving by using high-speed computers in forecasting studies and other problems of a statistical or probability nature.

SO_2 May Deter Smog

Air pollution abatement is not an engineering problem; rather, it is a communications problem between the utility and the public, said C. P. Smith, Pacific Gas & Electric Co. His remark stemmed from a one-year study of stack effluent and weather data in the San Francisco Bay area. Results of the study indicate that stack discharge from an oil-fired steam plant of current design is not a contributory factor to smog or air pollution. Smith added some authorities maintain sulfur dioxide added to the atmosphere will deter smog.

Substantially lower heat rates will accompany use of a gas turbine in the heat cycle of a steam plant, even in supercritical pressure plants, said E. O. Dowies, Arizona Public Service Co. Indications are that cost per net kw of capability would be less for combined plants than for conventional plants with identical initial steam conditions.

Cost-saving design features of 240-Mw ultimate San Bernardino Plant include short gas ducts, elimination of ID fans, operating deck 16 ft above grade, bolted structural steel, and an 82-ft cylinder housing eight storage tanks with deaerator on top. Other features, described by Fred Bagwell, California Electric Power Co, are air-foil sections in the boiler for air-flow measurement and use of sliding throttle pressure to reduce service on the feedwater regulator at low loads.

During a joint session on economic dispatch, K. N. Burnett, GE, said savings accruing to American Gas & Electric Co's system from use of a manual penalty factor computer for transmission losses are about $50,000 per 1,000 Mw of installed capacity. T. J. Bliss, Westinghouse, described the economic dispatch computer designed jointly by his company and West Penn Electric Co. The unit automatically proportions any given total load on an equal incremental basis among 11 steam plants and one hydro station operated by West Penn's three subsidiaries.

With an ear to the controversy over the economics of automatic economic dispatch computers, T. W. Hissey, Leeds & Northrup Co, suggested an approach for finding the possible savings offered by such equipment. In discussion, he said also that automatic dispatch computers will follow an incremental cost curve with an accuracy greater than the curve itself represents.

Cooperation between Arizona Public Service and Salt River Power District has resulted in construction of steam units in accordance with a mutually agreeable timetable, according to George H. Groh, APS. Two 100-Mw units now being built by Salt River will be followed by two by APS. Groh cited $750,000 saved by common planning of transmission serving the plants. Cooperative planning among APS, California Electric Power Co and Imperial Irrigation District has resulted in design of three 80-Mw units to be installed in the Yuma area. This plant will be owned by APS and Calectric and will be operated for all three.

Conductor vibration research at Preformed Line Products Co was described by J. R. Ruhlman. Statistical analysis of test data will be used to define frequencies and amplitudes allowable for each common support configuration. Field use of cycle-amplitude counters then can compare actual vibration loading with recommendations.

to Meet Rising Demands

Expansion of distribution systems utilizing present design practices will support residential heat pump and air conditioning loads economically, concluded H. E. Campbell, GE. P. F. O'Neill, also of GE, predicted that by 1960 51% of heat pumps sold will be 3-ton or smaller. His company's studies show a trend away from 3-phase units, based on overall economics.

Harry Jung, So Cal Edison, told distribution engineers practically no diversity can be expected for home cooling loads in high ambient temperature regions. For groups of five or more average homes all equipped with cooling other than heat pumps, demands of about 2 kva per home should be anticipated. As yet, no conclusive data are available for determination of optimum transformer capacity for groups of heat pumps. It seems reasonable, Jung concluded, to install kva capacity about equal to the arithmetic sum of individual demands.

PG&E Favors Large Substations

To meet annual summer peaks in Phoenix, all metropolitan substations are 69/12.5 kv and designed for 5,000 kw per sq mi load density with provisions for 7,500-kw future loads. To cut losses in these substations during lighter-load winter months, said M. M. Bridgewater, APS transformers can be taken out of service. Operating practice has borne out engineering studies which demonstrate that multiple switched-capacitor units give better feeder regulation than substation feeder regulators and at lower installed cost.

R. A. Moulton, summarized PG&E's large substation feeder policy. Diversity between total feeder and station load requires feeder capacity 10% above station capacity. Feeder loads are standardized at about 7.5 Mva. Conductors are sized economically (installed cost vs losses), not on thermal or voltage limitations. Underground getaway is utilized for safety and appearance. Trend is toward a small number of large 12-kv stations.

T. A. Bettersworth stated that PG&E limits short-circuits to 10,000 amp by splitting 12-kv buses. Faster feeder breakers and heavier-duty sectionalizers than now available are needed for best solution to the burn-down problem.

Moving toward economical underground distribution, western engineers are examining overhead transformers for vaults. Paul E. Rist, Arizona PS, cited 40-50% cost savings over subway transformers. But he noted manufacturers probably would not modify standard transformers designs for PILC cable entrances for only 1-2% of the market. He called for ingenuity by utility engineers to design a water-tight, easily installed, economical connection.

J. B. Bowen, San Diego G&E, described underground service to a luxury tract development where one pole-type transformer was located at each customer's pad or vault. A 4-kv 3-conductor PILC primary in ducts fed fused oil cutouts in small street manholes. Each cutout fed one to five rubber-covered primary services.

Reconductors Economically

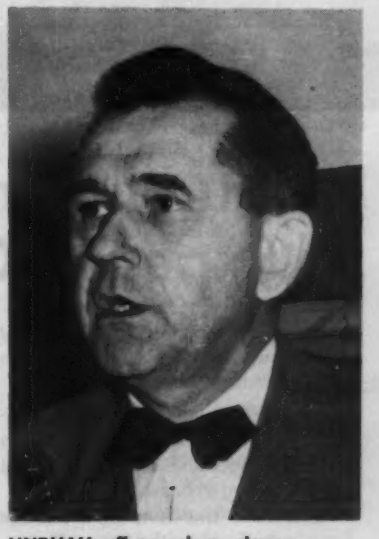
Twenty miles of 250-MCM conductor were replaced with 636-MCM ACSR, an operation which saved $2,600. E. M. Foster, San Diego G&E, attributed the economy to simultaneous pulls of three 6,000-ft reels in 90 min at each setup.

P. C. Oldershaw, PG&E, described measurement of moving-conductor tension. Average sag plus the friction factor is converted into approximate tension by use of suitable tables. Alternately, the pulling line is given a predetermined number of wraps around a polished cat head, and the operator applies just a little tension to the line.

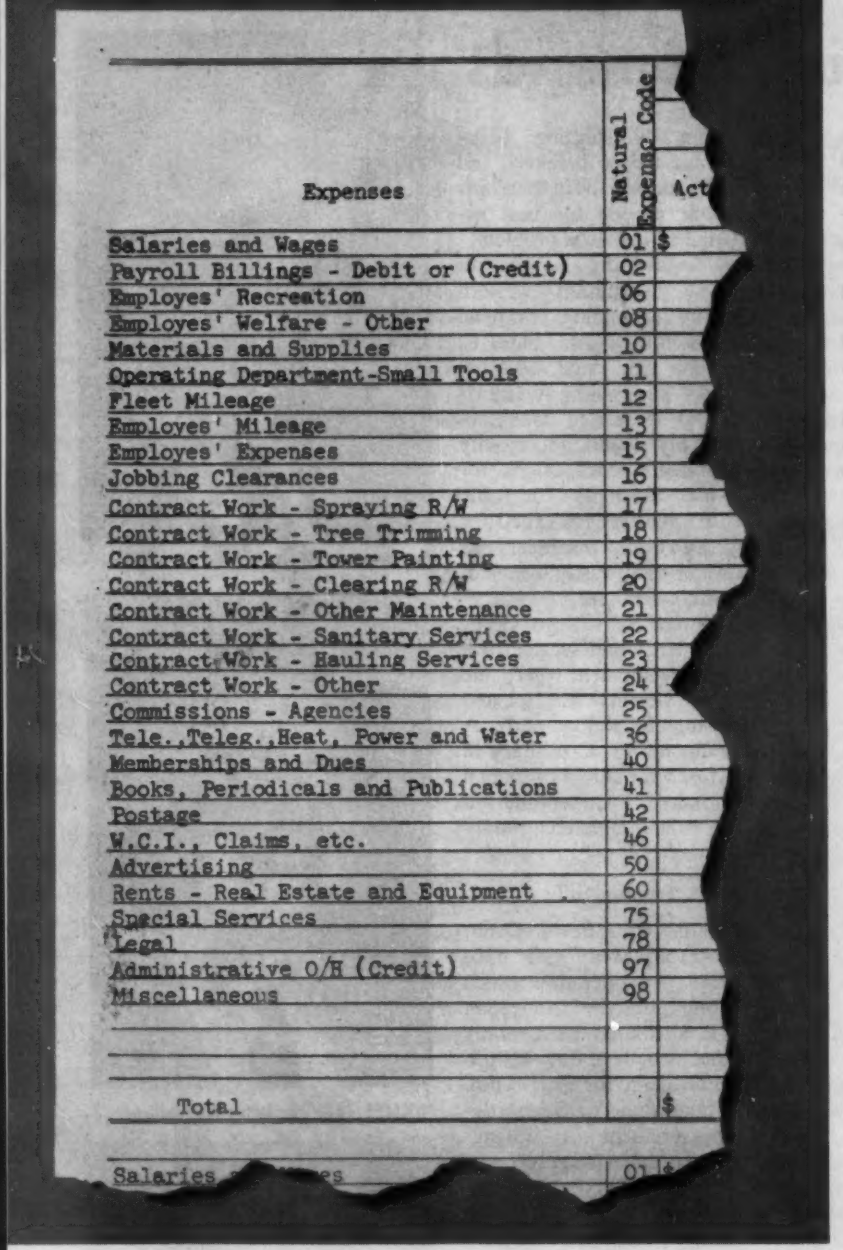
Laboratory and field tests indicate that vertical impulse turbines for low-head plants can be set relatively low to increase available head. Potential economy of low setting and tailrace depression by means of compressed air has not yet been fully exploited, said P. B. Dawson, Jr, Baldwin-Lima-Hamilton Corp. Trend in vertical impulse units is to self-lubricated bearings, with the pivoted-shoe type finding wide use.

CHADWICK catalogs the challenges

PHILLIPS calls for selective selling



LINDVALL offers only engineers



Expenses	Natural Expense Code	Act
Salaries and Wages	01	$
Payroll Billings - Debit or (Credit)	02	
Employes' Recreation	06	
Employes' Welfare - Other	08	
Materials and Supplies	10	
Operating Department-Small Tools	11	
Fleet Mileage	12	
Employes' Mileage	13	
Employes' Expenses	15	
Jobbing Clearances	16	
Contract Work - Spraying R/W	17	
Contract Work - Tree Trimming	18	
Contract Work - Tower Painting	19	
Contract Work - Clearing R/W	20	
Contract Work - Other Maintenance	21	
Contract Work - Sanitary Services	22	
Contract Work - Hauling Services	23	
Contract Work - Other	24	
Commissions - Agencies	25	
Tele.,Teleg.,Heat, Power and Water	36	
Memberships and Dues	40	
Books, Periodicals and Publications	41	
Postage	42	
W.C.I., Claims, etc.	46	
Advertising	50	
Rents - Real Estate and Equipment	60	
Special Services	75	
Legal	78	
Administrative O/H (Credit)	97	
Miscellaneous	98	
Total		$
Salaries [illegible]	01	

'Natural Names' Help in Expense Control

D. M. KAMMERT, Vice President and Comptroller, West Penn Power Co, Cabin Hill, Greensburg, Pa.

How do you make the "Operating Expense" section of the uniform system of accounts an effective tool in controlling expenses?

This is a question that utilities have asked since the start of prescribed uniform systems. And so far it is one that has been resolved with little success.

West Penn Power Co's answer is a system of budgeting and accounting by "natural name" classification by responsibility areas. This classification provides figures that are a valuable cost control tool. And although still developing and changing, it has already brought these advantages:

1. The "natural name" system furnishes a classification of expenses readily understood by all, including operating people and other non-accountants. Terms are understood because they're in the operating man's language. And in most cases the old bugaboo of allocations by regulatory accounts are avoided and handled uniformly by personnel trained in accounting.

2. It highlights important areas of expenses, particularly salaries and wages, along with related employee costs such as welfare, recreation, traveling expenses, auto mileage, and memberships and dues.

3. The system helps insure uniformity of classification of expenses. Therefore, the resulting statements of costs and comparisons by departments, divisions, or districts become meaningful and useful to the supervisor responsible for costs.

4. It furnishes an automatic analysis of the make-up of total costs, which otherwise would be obtained only by after-the-fact, time-consuming analysis.

A further benefit expected after gaining experience is the providing of yardsticks for measuring certain of these costs against number of customers, number of employees, revenue, and other factors.

Regulatory System Also Used

West Penn's system is in addition to that required by regulatory bodies. In other words, it is a system of accounts to meet regulatory requirements and a memorandum system of accounts which meets the need of true cost control by responsibility areas.

By application of machine accounting methods the added cost of maintaining a dual system has been kept to a minimum. The expense is more than offset by the better cost control which results.

A system of reports has been designed which accumulates the above-named costs by each area of responsibility and shows the comparison with the amount previously budgeted. Totals by responsibility areas are then grouped in like manner to make up total departmental expenses, and similar departmental summaries are totaled to arrive at over-all company results.

Although this method was new to West Penn two years ago, it is not entirely new in the electric utility industry. A few other companies use a similar plan, and it is also used outside our own industry. Retail department stores are adopting a "system to designate costs by natural names and by expense centers," according to recent business publication stories.

Uniform Accounts Have Limits

The prescribed uniform systems of accounts have generally met the regulatory needs and helped attain a reasonable degree of industry accounting uniformity. But as utility accountants, engineers, and operations people will attest, the systems' usefulness in cost control is limited.

While regrettable, this should not be surprising. It results from the very nature and composition of the specific operating expense accounts within the prescribed functional groups—production, transmission, distribution, customers' accounting and collecting, sales promotion, and administrative and general.

A simple illustration of one account pinpoints the problem. Account 781—customers' billing and accounting—"shall include the pay and expenses of employees engaged in customers' billing and accounting work, and supplies used and expenses incurred in connection therewith." Included in this list of items we find salaries and wages, supplies, book, postage, stationery and printing, building service costs (excluding rent), as well as the cost of statistical work on customers' accounts, and tabulating sales.

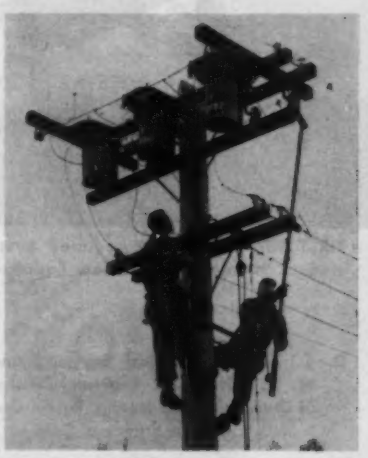
Costs Must Be Analyzed

The total costs accumulated within this account for a designated period, as measured against the number of accounts or customers handled, may be a reasonably good yardstick to compare one company's results with those of another. But for cost control purposes it is often desirable to know the cost elements that make up the accumulated cost, and that requires detailed analysis and breakdown of the cost elements after the fact.

With utilities becoming even more cost-conscious as prices rise, other companies may be interested in adopting the "natural names" system.

Apprentices Advance Faster

Puget Sound P&L linemen take 10-week course on own time with approval of IBEW



CLASSROOM STUDY, photo at top, is supplemented with pole-top training

Training of apprentice linemen is accelerated through a ten-session course devised and conducted jointly by Puget Sound Power & Light Co, Seattle; Local 77, IBEW; and Edison Vocation School of Seattle's school system. The first class of 29 men was "graduated" recently from the course.

"The school is a highly successful step toward developing qualified men for our expansion program," said A. L. Pollard, Puget Power operating manager. Graduates "have received accelerated apprentice lineman training which provides them with a gain of six months toward attainment of journeyman's rating. They still must obtain six months or more of line crew experience on hot line work before they are eligible for journeyman's rating."

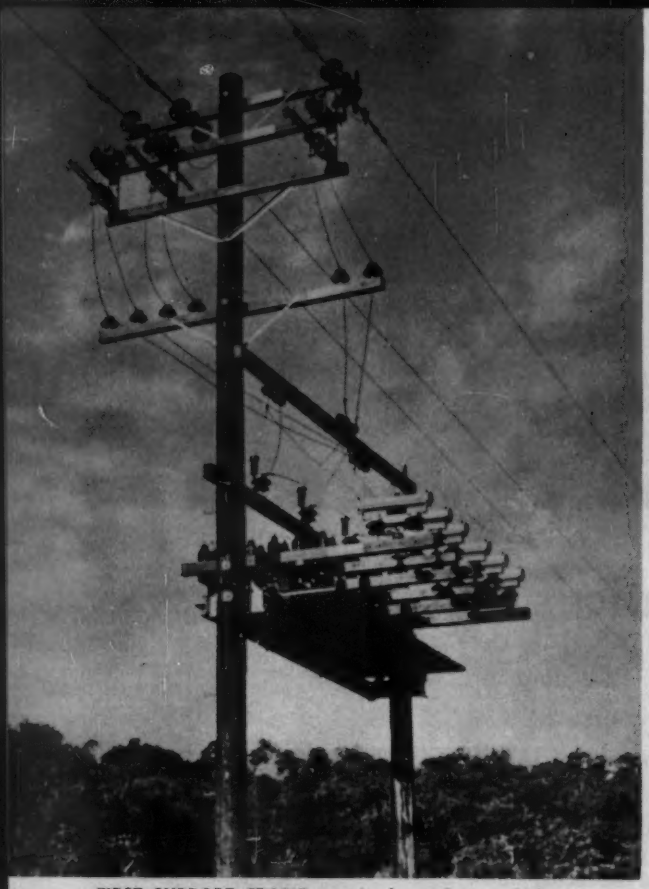
Half of each eight-hour session is spent in classroom study and half on equipment provided by Puget Power at its Renton, Wash., line headquarters. Ten sessions were presented on alternate Saturdays, with two groups being handled over a 21-week period. Trainees took the course on their own time. They came from an area extending about 100 miles from Olympia to Bellingham, Wash.

Classroom lessons covered fundamentals of transformers, line materials and tools, oil switch operation, and rigging and wire rope, with special emphasis on safe practices. In the outdoor training area trainees worked on actual poles and equipment under close supervision of veteran power men. Puget Power furnished industrial insurance, transportation, and tools for all the men.

Technical portion of the course was presented by Neal Purdy, Puget Power lineman. His time was paid for jointly by the union and the vocational school. Safe practices were presented by Joe Bradshaw, company safety engineer. Outside instructors described use of specialized tools, handling of work on transmission lines, and new methods of line construction.

Series Capacitors

- Swinging loads on rural feeders tamed
- Method is economical where loads do not warrant heavier facilities
- Pacific Gas & Electric Co engineers cite 9-yr experience record



FIRST SUPPORT FRAME required overhang of damping resistors. Standard design now equalizes weight on supports

D. C. KEEZER, Electrical Engineer, and **W. G. JOHNSON**, Engineer, Division of Distribution Engineering, Pacific Gas & Electric Co, San Francisco, Calif.

Series capacitors have solved severe voltage fluctuation and stability problems on some long rural 12-kv feeders for Pacific Gas & Electric Co. Twelve installations and nine years' operating experience have convinced PG&E engineers that this relatively new tool can be economical and reliable addition to their previously available methods.

The series capacitor overvoltage caused by heavy current surges long has been recognized as a disadvantage of series capacitor installations. The possibility of circuit ferro-resonance also has been a deterrant. But these difficulties have been mitigated by proper application of protective cone gaps and damping resistors.

Voltage fluctuations originated by sawmills, dredgers, and similar loads often cause complaints from other customers on the line. Revenue from such loads frequently will not support conventional corrective methods, such as extension of transmission to a new substation nearer to the load or use of larger conductors on the distribution feeder. Use of the series capacitor, however, may offer a solution compatible with revenue.

Series capacitors should not be applied until a survey of the fluctuating load can be made. Magnitude and instantaneous power factor of load swings must be measured. Sawmill load tests, for example, have shown that predicted voltage fluctuations based on theoretical analysis are unreliable because the sawyer's technique strongly influences load swing characteristics.

High-speed recorders, can measure feeder kw, kvar, and voltage simultaneously with all major loads operating. The charts establish magnitude and frequency of fluctuations. Analyzed in terms of circuit constants, they also indicate cause of voltage swings, degree of correction available, and optimum location for the capacitor bank. While a series capacitor is effective in reducing voltage dips caused by the lagging kvar component of load current through inductive reactance, it is not effective in reducing dips caused by the kw component through line resistance.

Although series capacitor applications must be engineered individually, experience gained has pointed to standardizing certain basic construction features.

The standard capacitor support structure is a two-pole prefabricated platform normally used for distribution transformer or regulator banks. Arrangements of mounting timbers and pillar insulators distributes the weight of the capacitors and resistors evenly. The arrangement also provides phase-to-phase and phase-to-ground insulation levels which meet local climatic requirements.

Typically, capacitor bank voltage rating is 15-25% of circuit line-to-ground voltage. Unless momentary currents are bypassed,

Stabilize 12-Kv Feeder Voltage

voltages several times rated may build up across the bank during fault conditions. The bank must be protected by a device operating quickly and reliably to limit voltage rise across it to about 250% rated voltage to prevent damage to individual capacitor units.

An arc gap, with various modifications, usually is shunted across the bank. Normally no current flows through the gap. Voltage exceeding the setting will flash the gap, dropping voltage across the bank to the arc-drop value and bypassing combined load and fault currents around the capacitors.

Gaps Must Be Self-Clearing

The gap's electrodes thermally must withstand persistent fault currents until the line is deenergized by overcurrent protective equipment. After a non-persistent fault has cleared, the gap must be bypassed by auxiliary contacts or must transfer load current back to the capacitor. Series capacitors usually are installed on relatively inaccessible lines subject to a high transient fault incidence. Thus the gap must be self-clearing to minimize costly service calls and extended outages of the capacitor bank.

The most reliable and inexpensive device PG&E has found for the specific protection of 12-kv series capacitors is the cone gap telephone circuit overvoltage protector. This gap consists of a rod passing axially through a cone, terminating in a spiral which has sufficient mass for good thermal capacity. When voltage across the capacitor exceeds the gap breakdown-setting, an arc is initiated between the rod and cone electrodes. Convection currents transfer the arc to the spiral where motor action rotates it at high velocity between the spiral and the cover. The motion of the arc prevents localized heating and electrode spatter. The gap will withstand up to 5,100 amp for at least 12 cycles with negligible damage.

This cone gap will extinguish arcs reliably up to 100 amp. When flashed over by a non-persistent fault or surge, the gap is self-protecting in that it can transfer load currents up to 100 amp back to the capacitor. If the gap is set to flashover at 250% rated capacitor current, persistent fault protection for the capacitor must be provided for 110-250% rated current and for the gap above flashover setting. In the unusual case where the line breaker setting will not provide this protection, a service restorer or fuse is installed on the source side of the capacitor bank.

The capacitor installed in 1951 at Cholame illustrates the use of a series capacitor to increase circuit voltage stability limit. It was connected temporarily in a 12-kv feeder until a 70-kv transmission line and substation could be completed the following year.

The feeder (Fig 1) a heavily loaded, high impedance circuit, had many irrigation pumps near the end of the line. Occasionally, starting a large motor exceeded the circuit voltage stability limit, dropping voltage so that already running motors drew more current, dropping voltage even further. Complete voltage collapse usually was prevented by operation of low-voltage protection on enough motors to enable line voltage recovery until motors were restarted manually and the sequence repeated. This is shown by the voltage chart in Fig 2. A 22.5-ohm series capacitor of fifteen 2.4-kv, 15-kvar units in parallel per phase corrected the condition. No resonance or other difficulties were observed during the short time this capacitor was in use.

Damping Resistors Omitted

The first five series capacitor banks were operated initially without damping resistors. Tests on the Georgetown capacitor at installation, including tripping and reclosing the line at minimum load, failed to disclose an incipient resonant condition. However ferro-resonant conditions subsequently appeared at the Oakhurst and Georgetown banks. Experience showed that:

1. An incipient resonant condition will not always be disclosed by field testing.

2. Changing circuit conditions may raise combined X/R ratio of source, line constants, series capacitor, and load from a stable value to one which will sustain oscillations.

3. Damping resistors should be installed during bank construction.

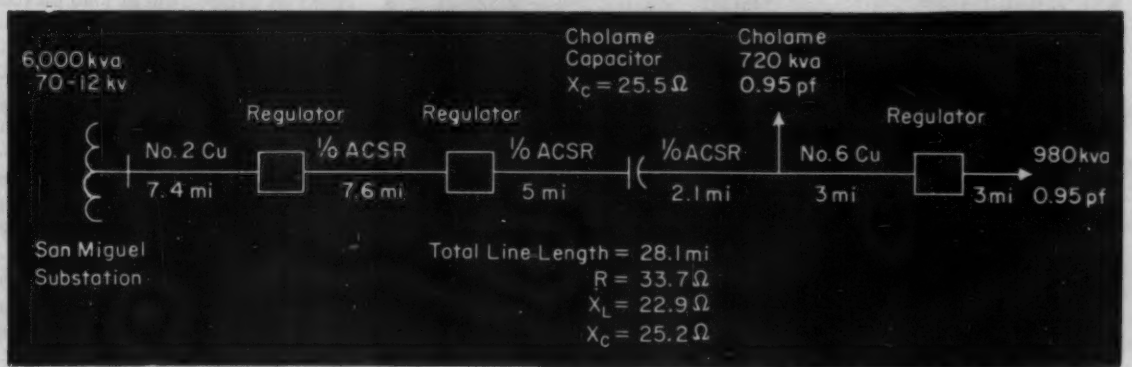


FIG 1—CHOLAME CAPACITOR was installed in a heavily-loaded, high-impedance 12-kv line. Operation was satisfactory until a scheduled 70-kv transmission line and substation could be placed in service to carry the load

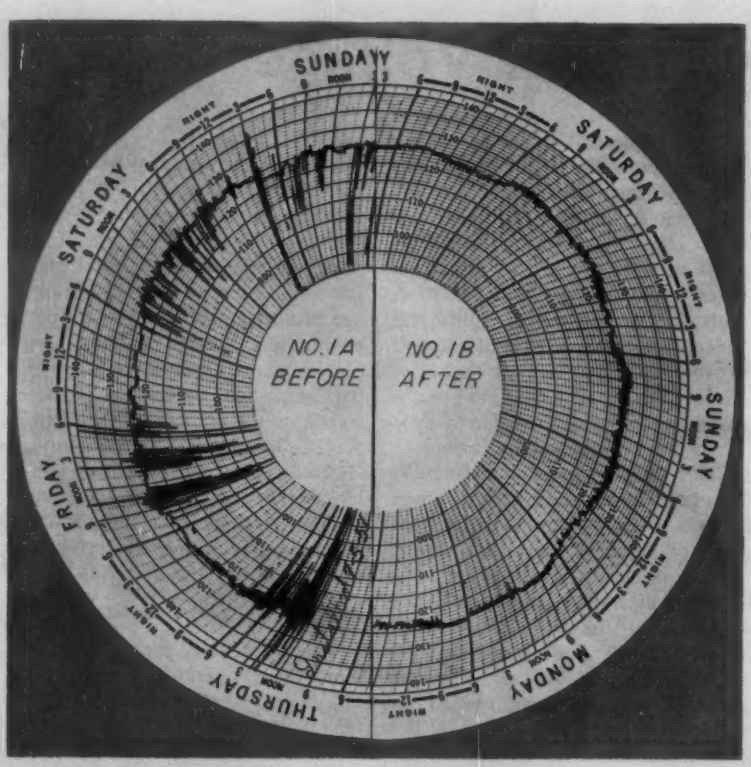


FIG 2—CHOLAME FEEDER VOLTAGE chart shows stabilizing effect of series capacitor with "before" and "after" record. No resonant condition was found

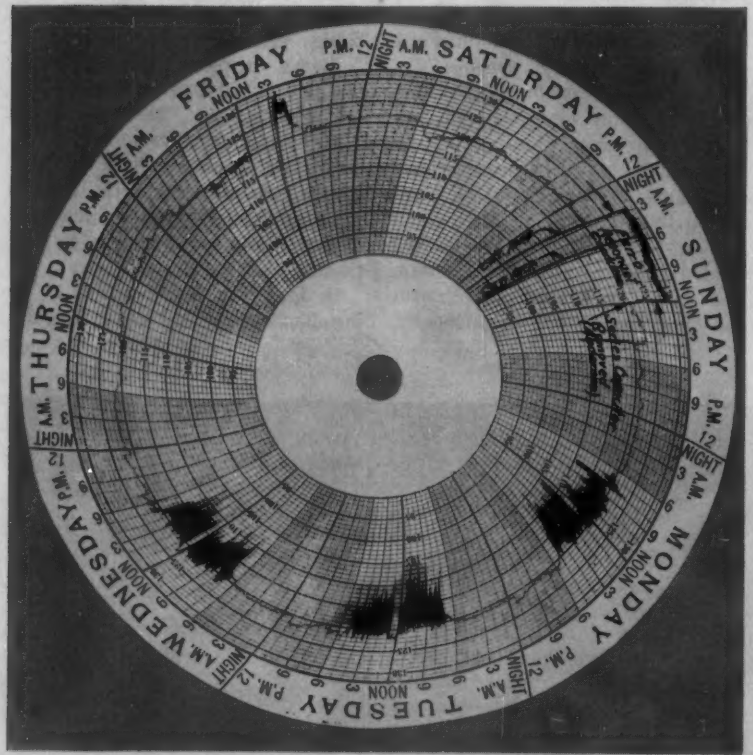


FIG 3—A RESONANT CONDITION was initiated by switching on the Oakhurst feeder. It was necessary to bypass the capacitor manually to reduce voltage

The size of the damping resistor which will prevent sustained series capacitor oscillations depends on circuit impedance, connected transformer kva, and capacitor rating. Computed vaules are so consistently near 200 ohm as to permit use of a standard 240-ohm tapped resistor. Tap selection is a compromise between the calculated optimum for damping and a reasonable steady state resistor loss. A value 10-25% above optimum gives adequate suppression of oscillations and moderate losses.

Costs Favor Capacitors

The Oakhurst series capacitor was installed in 1952 to reduce voltage fluctuations caused by a 150-hp sawmill headrig. Tests had showed a maximum dip of 10.5 v (7-v average) with load fluctuations up to 600 kw and 340 kvar at a four-per-minute rate. A 21-ohm capacitor of eighteen 460-v, 15-kvar units reduced average flicker to 1.5 v and raised steady state voltage level 8 v. Installed costs based on 100% for the 21-ohm series capacitor show that replacement of 12.2 mi of No. 2 bare copper with 1/0 copper or equivalent would have cost approximately 1,200%. Installation of a regulator and a 14-ohm series capacitor, plus replacement of 5 mi of conductor, would have cost 750%.

Resonant Condition Troublesome

Complaints from customers near the capacitor bank revealed that trip-out and reclosure of the line breaker during minimum load periods was initiating a resonant condition. Complaints cited high voltage, 20-cps light flicker, and low speed motor operation. Usually, oscillations damped out as load picked up. Circuit overall X/R ratio apparently was just sufficient to sustain oscillations initiated by switching.

Fig 3 shows voltage increase from 120 v at trip-out to 130 v after reclosure. The higher voltage was the sum of the 60-cps fundamental plus a subharmonic whose frequency was determined by the resonant circuit. A second trip-out is shown as again inducing oscillations which continued until the capacitor was bypassed manually. Following installation of damping resistors, the condition has not recurred.

A Special Report

Computers Take Over

System Dispatch

LEONARD M. OLMSTED, Managing Technical Editor

Automation has reached new heights in the power generation field. Computers are taking over full direction of economic dispatch to make possible the ultimate economy in production cost of delivered power. And power dispatchers have been relieved of endless complex evaluations.

Fuel has always been a major operating cost. But fuel economy involves much more than using most efficient plants to their maximum capability. It must recognize inherent differences between units in these plants and incremental fuel rates at their various valve openings. Complications are introduced by power transmission losses and offers of economical surplus power by neighboring utilities.

Today computers are being linked directly to load control systems to achieve more economical dispatch than practicable even with computer-guided manual control. This report tells how one utility has placed all major generation under completely automatic control. It describes plans of another system to entrust a computer with control of steam plants for economic coordination with hydro. And it describes a computer which saves $24,000 yearly by providing a continuous guide for loading schedules.

GEDA Assumes System Control

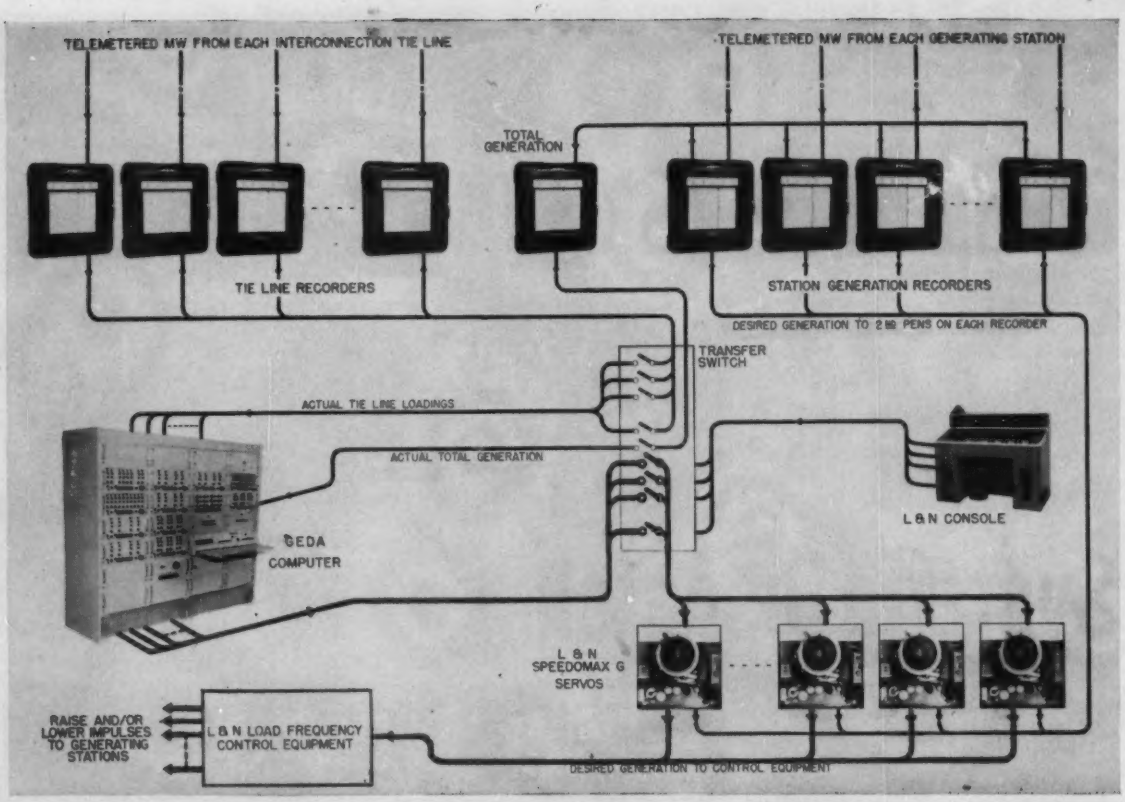
Ohio Edison applies automation to economic dispatching and load-frequency control, supplanting pre-calculated dispatch curves.....p 80

Early Bird to Assign Generation

Computer is coupled to load-frequency control of steam generation to hold Southern System's incremental delivered power cost at minimum.....p 84

EGAD is 5-Function Computer

Applying it to load assignment, spinning reserve, generating schedules, maintenance, future load studies, saves Colorado PS $24,000 yearly.....p 87


TELEMETERED MW FROM EACH INTERCONNECTION TIE LINE
TELEMETERED MW FROM EACH GENERATING STATION
TOTAL GENERATION
TIE LINE RECORDERS
STATION GENERATION RECORDERS
DESIRED GENERATION TO 2 MS PENS ON EACH RECORDER
TRANSFER SWITCH
ACTUAL TIE LINE LOADINGS
ACTUAL TOTAL GENERATION
L & N CONSOLE
GEDA COMPUTER
L & N SPEEDOMAX G SERVOS
RAISE AND/OR LOWER IMPULSES TO GENERATING STATIONS
L & N LOAD FREQUENCY CONTROL EQUIPMENT
DESIRED GENERATION TO CONTROL EQUIPMENT

BLOCK DIAGRAM of GEDA (Goodyear Electronic Differential Analyzer) shows how the computer is connected to the control equipment and how the telemetering equipment, in turn, is connected to the computer at Massillon control center

GEDA Assumes System Control

Ohio Edison applies automation to economic dispatching, load-frequency control

R. H. TRAVERS, Operating Results Engineer, Ohio Edison Co, Akron, Ohio

Automatic economic dispatching of load-frequency control, pioneered by the Ohio Edison Co System, has been supervising this 8,900-sq-mile system since last November.

This new installation crowns Ohio Edison's development of generation scheduling on an incremental basis since the company's Carl D. Zimmerman introduced the principles in 1928. Today Ohio Edison applies its electronic differential analyzer to continuous determination of economic dispatch, including the effect of incremental transmission losses, and to automatic realization of this optimum scheduling.

Its electronic dispatch computer is not a new device. Rather, it is a new packaging of proved computing elements for a particular system problem. Its flexibility makes it applicable also in billing, budgeting, system planning, and system economic analysis.

Before 1950, plant incremental generation costs could be adjusted satisfactorily for transmission losses by I^2R calculations and the system could be handled by a simple load control installation controlling a single unit at a time. Economic allocation of generation was manual.

Today's transmission system is an extensive network with 13 generating stations, an early step in whose operation was installation of a comprehensive load-frequency control system. Adequate regulation, coordinated with economic allocation of generation, was stressed. In accomplishing this, great flexibility was built into the control system. Most generation units had automatic control.

Considerable development work went into the design of this control equipment to provide stations devices for effective control over the maximum rate of generation change in each plant. Rate-of-change limiting equipment has been extended to each unit on automatic control.

Dispatcher Has Master Control

Control equipment for the dispatcher's office included a master console containing manually set slidewires for programming generation allocation, ratios of the various plants' participation in the regulating response, and high and low Mw limits for constraining

action at each plant under the control system.

Initial generation schedules in programming this equipment were developed from incremental plant cost data adjusted for transmission losses. These were assessed against major plants far from load centers.

Ohio Edison, with Commonwealth Associates, Inc, and Westinghouse Electric Corp, developed incremental generating schedules. These recognized the incremental costs of generation and transmission. They were applied to the load control equipment by setting various dials on the console manually.

The problem of providing precalculated dispatch solutions for all probable combinations of units for a system containing about 50 generating units became insurmountable, even with up-to-date digital computing equipment. The dispatches were determined for the somewhat hypothetical condition of all generating units being available for operation. Then simple numerical procedures were outlined so that the dispatcher could eliminate quickly a non-operating unit's contribution. This procedure gave a useable, approximate answer. But it pointed up the desirability of solving coordination equations, taking into account all pertinent factors at the moment of solution.

Cooperate in Integration

Precalculated solutions required renting digital computer equipment and took many man-hours to set up complete schedules and outage correction data. The schedules were issued only at six-month intervals. But the need was apparent for a device using correct data continuously at the moment a dispatch was to be determined.

As analog computing equipment promised to meet all requirements, suitable equipment was investigated. Ohio Edison engineers became acquainted with Goodyear Aircraft's electronic computers for solving the mathematics of aerodynamics. Joint development by engineers of the two companies produced the GEDA Power Dispatch Computer which is operating on the Ohio Edison System today.

Another step was necessary: The computer had to be connected directly into the load-frequency control equipment for applying solutions to the system immediately. Goodyear, Leeds & Northrup, and Commonwealth Associates cooperated in this integration.

In general, it required retransmitting slidewires for feeding line flows and total generation to the computer and servos for feeding computer solutions to control equipment.

Provides Graphic Display

One servo for each plant measured output voltages of the computer which represented desired generation. Retransmitting slidewires on the servos fed this "regulating point," into the control equipment and positioned a second pointer and pen in each station generation recorder to indicate the request.

The graphic display of computer solutions on the same charts with the actual generation affords the dispatcher easy supervision of the overall functioning of the computer-control installation. The computer solves a set of standard coordination equations relating incremental production with incremental transmission costs. These are of the form:

$$\lambda = \frac{dC_1}{dP_1} + 2\lambda(P_1B_{11} + P_2B_{12} + P_3B_{13} + \ldots + P_nB_{1n})$$

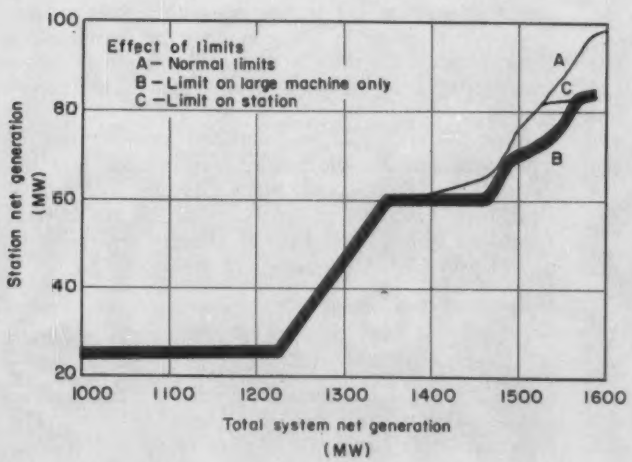
$$\lambda = \frac{dC_m}{dP_m} + 2\lambda(P_1B_{m1} + P_2B_{m2} + P_3B_{m3} + \ldots + P_nB_{mn}$$

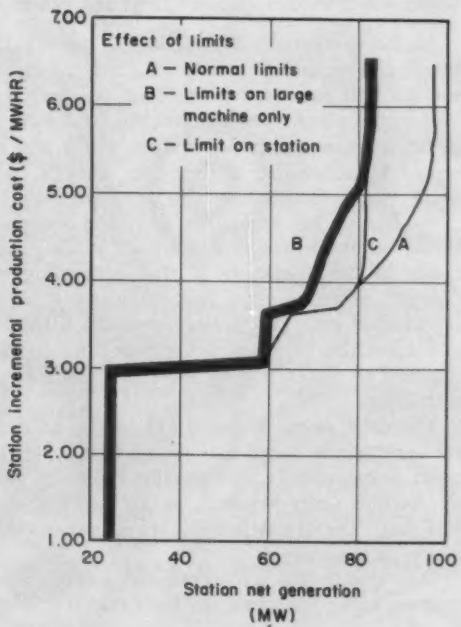
where λ is the delivered incremental cost of power to the system.

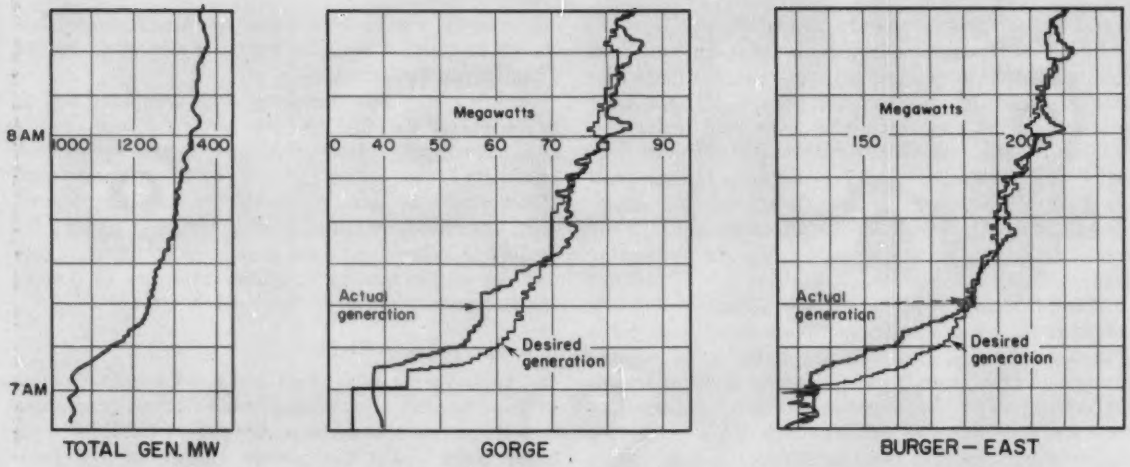
$\frac{dC_m}{dP_m}$ is the incremental production cost of plant m, and

B_{mm} is the transmission loss formula coefficient

15-MW CURTAILMENT OF MOST EFFICIENT UNIT alters economic dispatch for station to Curve B in chart below. Using normal dispatch curve A with a 15-Mw limitation at C to reflect the curtailment distorts incremental costs of power as shown by correspondingly identified curves in the chart to the right







PICKUP in system load on a typical morning is allocated among generating sources by GEDA and load-frequency control.

which in the above parenthetical expressions is used with power output term P_n to give the incremental transmission losses chargeable to each plant.

The B_{mn} coefficients are represented in the computer by standard fixed resistors on printed circuit plug-in cards. When a new loss formula is obtained, a corresponding set of resistors is mounted on an extra set of cards. When the time comes to make the change in the computer, the entire set of coefficients can be substituted in 10 min.

The simultaneous equations are solved by selecting a value of λ and solving for each P_n. The latter are the required generation at each plant to satisfy that particular λ. The computer sums the P values to obtain a total generated P_t. If this P_t differs from that desired, λ is increased, or decreased, and new solution obtained. This process is automatized, and solutions are almost instantaneous.

Computer Provides Drawer for Each Plant

In the computer a drawer unit is provided for each plant, and in each drawer unit a printed circuit incremental heat rate card is installed for each generating unit in the plant. The incremental heat rates are nonlinear functions of power output which can be represented by successive straight-line sections. The cards use a resistor diode network to represent these functions.

Each card has adjustable high and low-power limit setters so as to recognize correctly loading restrictions likely in the operation of that generating unit. An "on-off" switch with a light indicates when the unit is switched on. The drawer contains a fuel cost dial and adjustable high and low-power limit setters for the imposed on the station by local or transmission loading restrictions.

The total plant's incremental cost is needed for the solution of the coordination equations, and the computer automatically obtains this value by adding up the various units switched on and multiplying by the fuel cost. The dispatcher can set up any operating condition as it occurs.

One station has a complicated steam cycle with a topping unit. The company feels that it is not possible to prepare accurate incremental heat rate data on an individual unit basis. Accordingly, over-all plant heat rate curves have been provided for various combinations of units. The station simulator drawer accommodates ten such cards. Choice between a unit and an overall approach to specifying heat rate data is limited only by the data itself.

Brings Substantial Savings

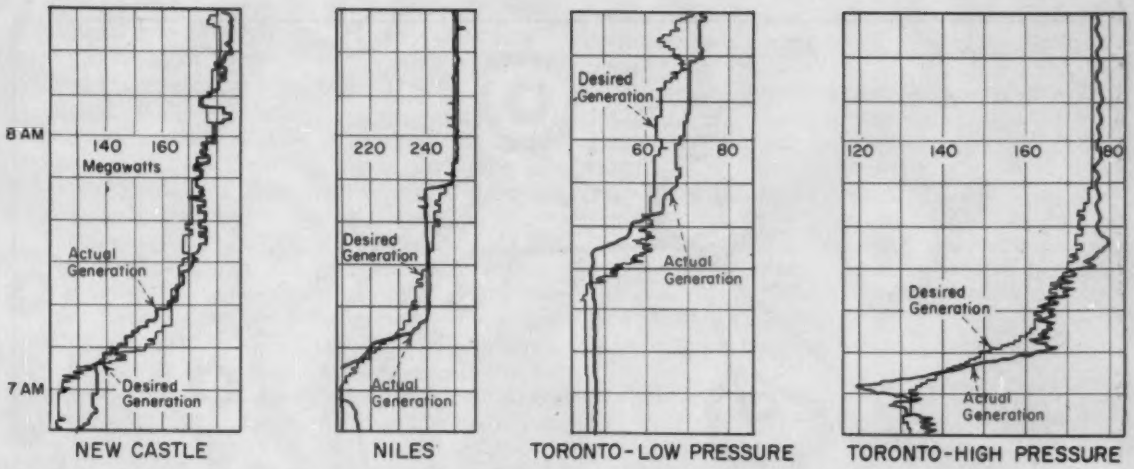
When a 15-Mw limitation on the most efficient of a plant's three units, each with widely different incremental heat rate characteristics, is represented with a station limit setter, the resultant dispatch assumes that the restriction occurred on the least efficient. Station loading is considerably retarded in certain ranges when the limitation is on the proper unit limit setter. This correct solution brings substantial savings.

Non-conforming loads and tie lines with other systems are treated as though they were generating plants in the coordination equations, except that they may be negative (power flowing out of the system) and do not have an identifiable incremental cost characteristic. Yet any power flow on a non-conforming load or a tie must be considered in the dispatch of the system's plants. These flows become constants at any instant of solution, but are variable with respect to time. Provision is made in the computer for representing them, either by setting a dial or having the system telemetering equipment continually feed in this information.

How the computer is connected into the control equipment and the telemetering equipment into the computer are shown in the block diagram. The control equipment functions primarily to satisfy the system regulating demand and then to allocate generation in accord with GEDA's solutions of the equations.

Must "See" Deviation

Were the computer to give a dispatch not matching the required generation total, system regulation would not be affected. The control equipment must "see" tie line deviation before it initiates a change in output. The computer could run down to zero, or up to full load,



Station charts show loading allocation by black lines displaced for clarity about 5 min ahead of actual output

without affecting the tie line balance. Were this ever to happen, and the computer left in the control chain, load distribution among various plants would be at random.

To guard against such a contingency, an Esterline Angus recorder has been connected to the computer to give a graphic record of λ. This record helps in analyzing abnormal periods of system operation, such as loss of a major unit.

The transmission loss constants used in the computer have been determined upon the assumption that all loads, other than a few specific non-conforming ones, always remain in the same ratio.

Should it become necessary to use the other type of loss formula which recognizes different rates of change for the various loads, thus introducing a B_0 term into each equation, the computer can be adapted readily by changing one resistor in each transmission loss card.

As power system research continues, it is quite possible that an entirely different mathematical approach will be developed. GEDA being the flexible computing device that it is, the company anticipates that any conversion for solving the new form of mathematical expression can be accomplished by reconnecting the computing elements and possibly adding others.

Has Over 4 Months Operation

The computer has been in operation longer than four months. Its performance, along with that of the control equipment, has been very gratifying. Probably its most severe duty is a morning load pickup. The chart records show a load pickup of 340 Mw in a 2-hr period. Of this total, 180 Mw was picked up in the first 20 min, and the remainder more gradually. During the entire period the computer supervised the control equipment. Various plant charts show how the system responded and that, while some plants lagged behind desired generation by a few minutes, unable to follow the fast rate of change called for, others went ahead to satisfy the system regulating demands.

System control equipment installed between 1951 and 1953 did not have sustained and fringe type of control action. But connection of the computer into it gives overall results comparable to those obtained with more modern control systems. The computer was placed in the so-called "automatic operation" of the system within two weeks after delivery, and results have been satisfactory. Its operation is relatively simple and straightforward.

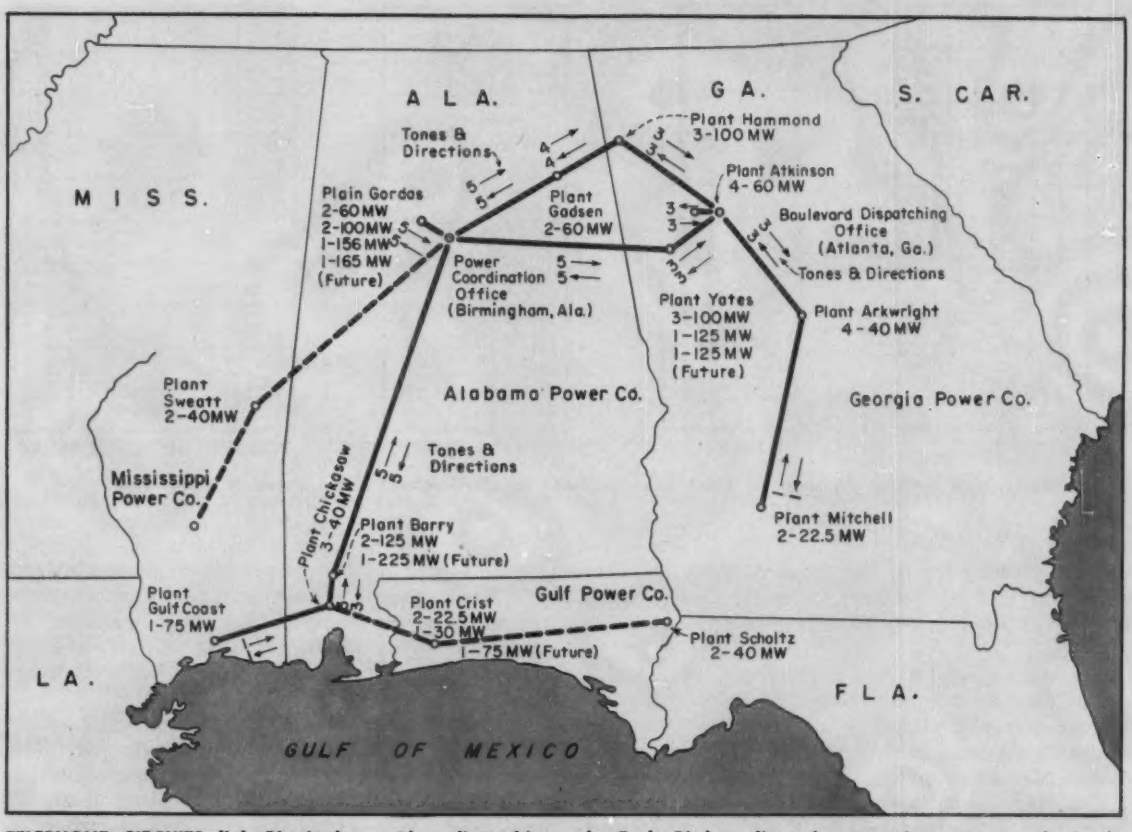
During the first few weeks, minor difficulties were encountered which required straightening out. The computer has a self-checking stabilizing current which continuously corrects zero drift of its many dc amplifiers. Inability to correct this drift indicates amplifier failure. A voltage then builds up across neon lamps which conduct and flash, locating the trouble. A trip circuit is energized which shuts off the computer and trips off load control equipment.

The company found that somewhere in the load control equipment some high-frequency interference, or "noise," was being generated and fed back into the computer through interconnecting wires. Although search failed to locate the source, the difficulty was overcome by RF filters on each wire interconnecting the computer with the load control equipment. Some 20 filters are mounted in a metal-wall box less than 18 in. square and 4 in. deep.

A major advantage of the GEDA as a control system adjunct is its use for obtaining data useful in the broader concepts of system operation. It is equipped for switching the computer quickly out of the control chain and simultaneously returning control supervision to the master load control console.

The computer obtains tie line cost data for the scheduling and billing of economy interchange transactions, for determining typical dispatch data for estimating future kwhr output and production costs at plants, and for correlating data for engineering and operating analyses.

When a change in operating efficiencies prompts recalibration of a heat rate card, the new curve can be plotted and, by using the X-Y recorder as a curve follower, the computer controls the system during the process. Several times the computer has obtained dispatch data for use as a guide in setting up ac network analyzer studies.


A L A.
G A.
S. CAR.
M I S S.
Tones & Directions
Plant Hammond 3-100 MW
Plant Atkinson 4-60 MW
Plain Gordas 2-60 MW 2-100 MW 1-156 MW 1-165 MW (Future)
Plant Gadsen 2-60 MW
Boulevard Dispatching Office (Atlanta, Ga.)
Tones & Directions
Power Coordination Office (Birmingham, Ala.)
Plant Yates 3-100 MW 1-125 MW 1-125 MW (Future)
Plant Arkwright 4-40 MW
Plant Sweatt 2-40 MW
Alabama Power Co.
Georgia Power Co.
Tones & Directions
Mississippi Power Co.
Plant Chickasaw 3-40 MW
Plant Barry 2-125 MW 1-225 MW (Future)
Plant Mitchell 2-22.5 MW
Plant Gulf Coast 1-75 MW
Gulf Power Co.
Plant Crist 2-22.5 MW 1-30 MW 1-75 MW (Future)
Plant Scholtz 2-40 MW
L A.
F L A.
GULF OF MEXICO

TELEPHONE CIRCUITS link Birmingham, Ala., dispatching center with the generating stations in three states to enable the Early Bird to dispatch generation so as to obtain the lowest overall incremental cost of the delivered power

Early Bird to Assign Generation

Computer to hold Southern's incremental power cost close to theoretical minimum

E. J. EARLY, Manager, Southern Co Power Pool, Southern Services, Inc., Birmingham, Ala.

When the Early Bird computer takes over control of generator loading on the Southern Co system a few months hence, economic dispatch will hold the incremental cost of delivered power well within $\frac{1}{10}$ mill of the theoretical minimum. The computer-control system is considered capable of greater precision, even to $\frac{1}{50}$ mill. Whether power station governors and boiler controls are capable of such precision for changing system loads has yet to be determined.

Automatic control will be applied initially to 28 units in ten plants totaling 2,315 Mw. During 1958-59 the system is scheduled for extension to 12 more units aggregating 377 Mw in five additional plants and to four new units adding 636 Mw at existing plants. This schedule will put 3,328 Mw of steam capacity under automatic control by 1959. It is expected that all new steam units will have automatic control.

These changes will enable the Southern system to regulate net tie-line interchange with steam units instead of two approximately 100-Mw hydro plants which have had automatic load frequency control for the past 15 years. The decision to change to automatic steam control was in no way dependent upon the Early Bird. But, with its computation of economic dispatch, these steam units will regulate net interchange while delivering power to the system at the lowest cost.

Savings in going to automatic steam regulation are expected to pay off the $300,000 investment in automatic control equipment in less than two years. Hydro regulation had been estimated to cost the Southern system $250,000 to $300,000 a year in inefficient use of water, loss of week-end storage, and increased maintenance. Steam regulation will cost far less because the megawatt changes on the large controlled capacity will be so slow that economy and maintenance should not be affected appreciably. The existing automatic control of the two hydro plants will be retained for emergency use.

Many questions have been asked since the Early Bird was described in Electrical World (Jan. 10, 1955, p 62). Some are answered as follows:

Q: Has experience proved out estimates that the Early Bird would save $200,000 per year by enabling optimum generation for existing system conditions, with no increase in personnel or operating expense?

A: Results during nearly three years of operation more than justify original estimates. Our considered opinion is that savings to the Southern system from economic loading of generating plants under Early Bird control will be at least $400,000 a year.

Maximum economy of power supply is realized when the incremental cost of power delivered to primary substations is made equal for all generating plants. This type of operation brings a decrease of transmission losses partly offset by an increase in plant production costs per kwhr generated. Loading generation for minimum transmission losses is not economical because the increase in production expenses more than offsets additional savings in transmission. Maximum economy is realized when proper consideration is given to both production costs and transmission losses.

Before installation of the Early Bird, Southern system generating plants were loaded primarily on the basis of minimizing production costs at the plants with consideration of transmission losses. Operation with the Early Bird was expected to reduce losses but to increase somewhat unit cost of energy at the plants. Actual operation has realized the expected savings in transmission losses, but surprisingly without the expected boost in unit production expenses. This paradox is attributed to improved accuracy in determining incremental production costs and in the loading of generating units with the Early Bird. Loading is changed in blocks of 2, 3, or 5 Mw. Formerly units were loaded in blocks of 5, 10, or 20 Mw. Further improvement in this respect is expected when automatic control guided by the Early Bird computer loads generating units in blocks of less than 1 Mw.

Transmission losses during 1955 were actually less than 1953's despite an increase of 16% in power delivered to substations. Percent transmission losses decreased from 8.33 in 1953 to 7.15 in 1955 and to 7.00 in 1956, the cut in generation requirements amounting to some 250 million kwhr a year. Dollar savings associated with a transmission loss saving of this magnitude are quite substantial. With our assumed average cost of generation of 2.5 mills per kwhr, the decrease in generation because of the reduction in transmission losses would exceed $600,000 a year.

The addition of 600 Mw in two new generating plants during this period, together with transmission to handle their output, reduced losses during peaks. But their improved efficiencies and lower production costs required that these units be operated up to the economic limit of the transmission facilities during off-peak periods.

It is not possible to determine from the operating records exactly what part of savings in transmission losses are produced by economic loading of the generating plants. A representative hour of actual operation during 1955 was set up and studied on the network analyzer. System load during the hour was about 75% of peak load. Losses with actual plant loads were 68 Mw, or 3% of generation, less than when plants were loaded for minimum cost at the bus bar. This study strongly indicates that the 1.18% of generation saved in transmission losses during 1955 resulted principally from economic loading of plants rather than from other causes.

The expected boost in unit production expenses at the generating plants has not materialized. In 1953 fuel plants generated 11.4 billion kwhr at a fuel cost of 2.52 mills. These same plants generated 10.5 and 10.7 billion kwhr in 1955 and 1956 at substantially the same unit cost, despite a 6 to 7% rise in fuel costs. The heat rate per net kwhr for these plants decreased from 12,460 Btu in 1953 to 12,065 Btu in 1955 and 12,128 Btu in 1956. New generation produced 3.2 billion kwhr in 1955 and 4.3 billion kwhr in 1956 to supply the increase in load and a deficiency in hydro generation.

Q: What changes have been made in the original concept of the Early Bird because of operating experience or technical advances since 1955?

A: None. The original basic idea of optimizing system operation by loading generating units for equal incremental cost of delivered power has been found sound and will be retained in automatic operation. Accuracy is expected to be greater than has been feasible with manual control. The only addition other than automatic control is provision for reading the incremental cost of power on each tie line. This feature will facilitate interchange transactions with neighboring utilities.

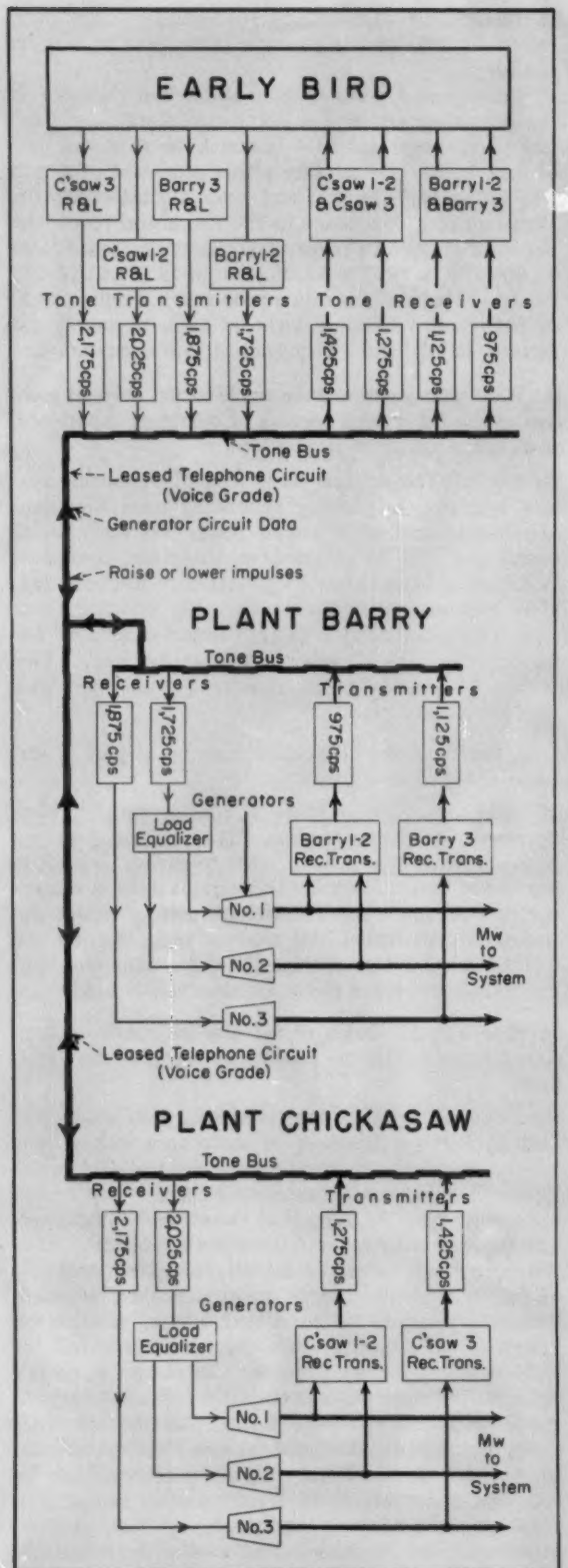
Q: How will the Early Bird function as part of the automatic control system?

A: Automatic load frequency control takes preference over economic loading. Raising and lowering impulses from the master load frequency controller are routed by the Early Bird to various units in a manner to maintain equal incremental cost of power delivered for all units. All changes in generation are directed toward best control of system regulation and no changes are made solely for economic loading.

Q: How was the design of the new automatic control system tested before the decision to add it to the Early Bird?

A: Equipment suitable for controlling three plants was built by Leeds & Northrup in accordance with designs for the complete automatic system and installed in the Power Coordination Office control room. This equipment was tested by using it to record at 12-min intervals the incremental cost of delivered power for each of the three plants as well as the average incremental cost of the three plants. Study of the data thus recorded, including positions of all control relays, verified the design of the proposed automatic control system.

Heat dissipated by electronic relays and accessory units during these tests presaged excessive failures if the ultimate 30 sets were installed in the computer cabinet, as well as additional expense for air conditioning. Leeds & Northrup corrected this condition by redesigning all amplifiers, signal routing relays, and regulating limit relays to use transistors. Transistorized power supplies purchased from another manufacturer will be installed with the permanent equipment. Service test for seven months with this transistorized equipment presages high reliability and minimum outage time. Load-frequency control to be used at the plants



EARLY BIRD analyzes the generation reports from both plants on this telephone circuit, computes load changes and originates impulses to either raise or lower the unit outputs

is similar to some 300 installations of standard equipment not considered to require further testing.

Q: How are "raise" and "lower" signals from the Early Bird automatic control transmitted to the different generating units? And how are generator loading measurements sent to the Early Bird?

A: Frequency-shift tone equipment will transmit "raise" and "lower" impulses over leased voice-grade Bell Telephone circuits to the generating units. A tone shift in one direction carries the "raise" impulse; a shift in the opposite direction, the "lower". An additional tone channel reports Mw loading back to the Early Bird. Circuit mileages required for the initial installation are:

Gulfcoast-Chickasaw-Barry-Birmingham	275
Birmingham-Gorgas	32
Birmingham-Gadsden-Hammond-Atlanta	167
Birmingham-Yates-Atlanta	153
Atlanta-Arkwright-Mitchell	170

Additional circuits will be leased as other plants are put under automatic control. These mileages will be:

Eaton-Sweatt-Birmingham	217
Scholz-Crist-Chickasaw	192

These voice-grade circuits are full-metallic with no grounded loops and bridged taps removed from local channels. Their 300-to-2,800-cps usable range accommodates up to 17 channels per circuit at 150-cps spacing. As used, the Early Bird will control individual units or groups of units. Equipment at each plant to compute individual-unit loading for incremental cost impulses directed to the plant would require additional investment and would not decrease the number or mileage of leased telephone circuits.

Q: Has there been any change since January, 1955 in area served or in size of generating units?

A: The Southern system still comprises the same four companies—Alabama Power, Georgia Power, Gulf Power, and Mississippi Power. Major generation is 17 major steam plants, up from 15 two years ago, and the same 18 major hydro plants. The peak estimated for 1957 is 3¾ million kw.

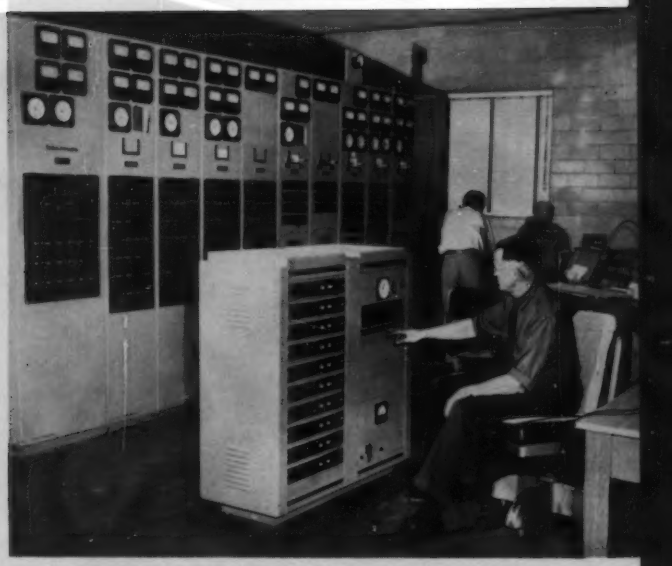
Q: To what extent can the Early Bird with automatic control be adopted by other utility systems? What kind of systems can use it? What kinds might find it impractical or uneconomic? Why?

A: The Early Bird can be used on any system, but would probably be economically justified only where transmission losses are a substantial factor in the cost of delivered power. If an economic loading computer, such as the Early Bird, is used on a system having automatic load control on steam units, the computer must be included in the control system. Adding the automatic loading feature to the Early Bird solely to obtain maximum economy of power supply cannot be justified.

The savings realizable with an Early Bird can be determined by network analyzer studies with units loaded in one case on the basis of incremental generating costs at the plants and in the other case on the basis of equal incremental cost of delivered power. Where transmission losses are not a primary concern, substantial savings can be realized from loading generating units for equal incremental cost at the busbar.

EGAD Is 5-Function Computer

Applicable to load assignment, spinning reserve, generating schedules, maintenance, future unit studies; saves $24,000 yearly



LOAD DISPATCHER used Electronic Generation Assignment Device, exclusively a computing facility in constant use

J. L. McKINLEY, Staff Engineer, Electric operating Department, and

D. O. BALLINGER,* Electrical Engineer, System Planning Department, Public Service Co of Colorado, Denver, Colo.

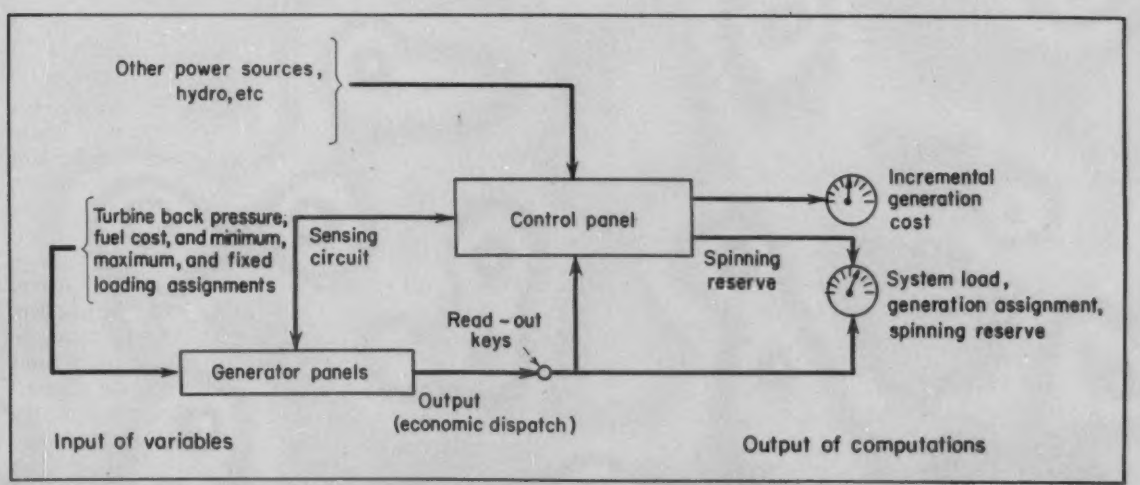
An electronic generation assignment device obtains for Public Service Co of Colorado specific solutions to dispatching, maintenance, and planning problems. Called the EGAD, this computer has five primary functions: Economic assignment of load for each of ten generating units on the system, indication of spinning reserve, predetermination of generating schedules, justification for accelerated generator maintenance, and study of the economic efficiency of future units. An exclusive feature is direct insertion of turbine back pressure from each unit into the economic dispatch computation.

Based on its six months' experience, the company estimates that the EGAD will provide annual savings of at least $24,000. As off-peak loading presents new problems, benefits may rise to $50,000 yearly.

Spinning reserve is indicated by direct and automatic computation when the dispatcher presses a button. As the EGAD displays incremental energy cost continuously in mills per kwhr for any total system load served by any combination of units, it enables schedule assignment of units over the expected range of system loads.

Display of incremental energy cost allows EGAD to serve in determining the economics of accelerated maintenance. Cost of generation, with and without a specific generating unit, can be computed readily. Imposition of system load on a group of less efficient machines during scheduled maintenance on a more efficient, 100-Mw unit brings higher generation costs. One study

* Now Electrical Engineer, Superior Distributing Corp, Denver, Colo.



TWO DIALS provide read out for all computations on the EGAD based upon pre-established machine constants and operating variables. The device as used by the Colorado utility does not as yet control its system generation directly

showed that more than $3,000 per week can be spent to accelerate maintenance and thus shorten down time of the more efficient unit.

In investigating the economics of proposed additions to generating capacity, incremental heat rate curves, representing individual generating units, are introduced through plug-in boxes. A proposed unit can be added to the system through use of the proper incremental-heat-rate plug-in boxes. As EGAD is then operated over projected system loadings, the proposed unit is evaluated by comparing direct computations of incremental energy costs. These are important in choosing between capital costs vs higher fuel costs for the addition's life.

The EGAD serves the day-to-day need of the system load dispatcher. Conventional dispatch curves had been used previously for the economic loading of generators. With ten units generating in the Denver area, at widely varying fuel costs which were often in the same station, dispatch curves became formidable in number. Variations in turbine back pressure on one unit also required a new dispatch curve representing the relationship of generation assignments. Similarly, the availability of units took a completely different group of dispatch curves for each combination.

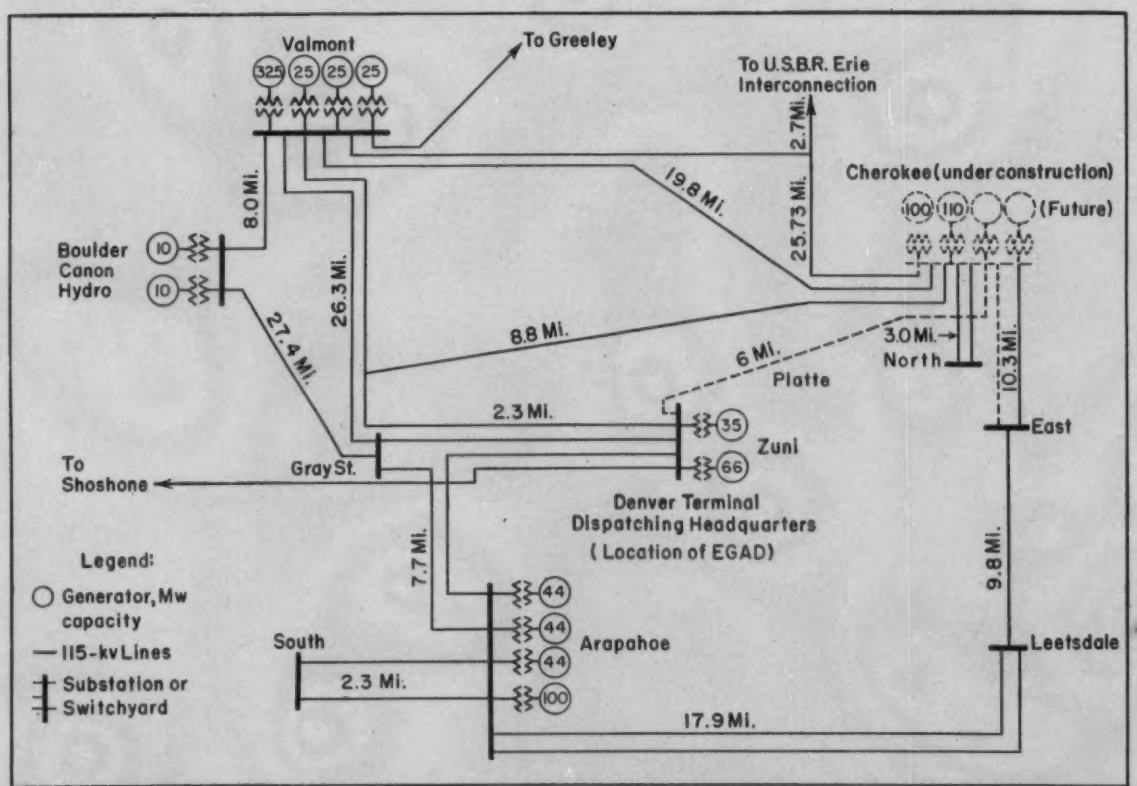
Variables Considered

These curves were modified further by consideration of other variables. Maintaining a fixed load assignment on a generating unit presents more complications when economic dispatch curves or conventional loading slide rules are used. Recognizing all these factors, the EGAD instantly computes each unit's economic dispatch.

Figure on p 87 shows how the computer works. Having set all variables, the dispatcher changes only the desired total system load. Economic generation assignment for each machine is then read on the same scale when he presses a button. the computer is in two standard relay rack cabinets with a 3-in. angle section steel base. It is about 48 in. high. The dispatcher from his seat can reach all controls. Mounted on skids, the computer can be operated wherever there is a power source.

Ten panels represent individual generating units, and there is space for more panels. The right hand cabinet houses control equipment, "read-out" panel, and the power supply chassis. Its top panel covers the control equipment and includes a dual-scale meter calibrated in 0-160 and 0-800-Mw scales. The lower scale is calibrated for the full capacity of the largest generating unit expected on the system; the upper for the maximum system load with a margin for growth. Scale calibration is readily changeable. This meter displays system load continuously as set in by the dispatcher.

Near the meter are two spring-



SYSTEM upon which the EGAD has been in continuous operation has its generating facilities so concentrated and such short transmission lines that there is no present necessity for introducing transmission system loss computations

loaded buttons for reading spinning reserve. The lower button is associated with the 0-800-Mw meter scale. The upper button permits the spinning reserve reading to be taken accurateley from the 0-160-Mw scale. The key at the far right is the computer's main control. It is spring loaded for a normally centered position. It is moved upward to increase the system load setting and downward to decrease it. Movement of this key obtains generation assignments after appropriate settings have been made on the generator panels.

Sources Included

The EGAD accommodates power sources not in the economic dispatch computation. These are set into dials on the panel below the megawatt meter and include purchased power, hydro generation, small generating stations on the system, and interchange power. Interchange power transfers may be set on a "net" basis or separately as "interchange in" which subtracts from the requirement, and "interchange out" which adds to the requirement.

The panel just below the control chassis has a "read-out" key for each generator panel. These spring-loaded buttons are depressed by the dispatcher who reads the generation assignments on the lower scale. There is space for three keys for future generator units and for read-out keys for at least 13 more units.

The lowest panel houses equipment supplying several types of power. Two panel-type fuses and a 3-position main power switch occupy the lower left. Switch positions are "off," "stand-by," and "on." The computer needs about 1 kw from a single-phase, 60-cps, 115-v source. The meter on the lowest panel shows incremental cost of generation on the ten generating units in mills per incremental kwhr. The scale reads from about 0.5 to 5 mills.

One of the ten generator panels in the left-hand portion of the computer is illustrated. Controls allow the dispatcher to set for variables associated only with individual machines. Starting at the left of each panel is the turbine back pressure setter. This control is calibrated from the performance characteristics of a specific turbine. Concentric circles represent three ranges of generator loading in each of which are three back pressure ranges normally varying radically with load. Back pressure is set in absolute inches of mercury from vacuum gauges and station barometers.

Two controls calibrated in megawatts establish, respectively, the lower and upper limits of desired loading. A fuel cost setter is calibrated in cents per million Btu. This dial's range covers anticipated fuel cost variations.

Frequent operating changes from natural gas to fuel oil and the different costs of these fuels at each station require a variation in the range of dials for the several fuel cost controls. Dials on the four lowest generator panels are calibrated differently because of a great variation in fuel cost. These calibrations are flexible and adaptable to any range of fuel costs.

Dial steps are thirds of a cent but can be decreased or increased, depending upon the range of prevailing fuel costs. The dispatcher needs only the fuel costs at each generating station in cents per million Btu for an appropriate setting. Three pilot lights indicate when the generator is operating in its minimum range as assigned, in its regulating range, or at its assigned maximum. The dispatcher follows these changing conditions.

Retains Assignment

Next to the pilot lights is a generation switch normally at "variable." To set a fixed load on a generator, total generation is adjusted temporarily to this desired fixed loading. Then, with the switch in the "fixed" position, the EGAD retains the assignment until a change is made. The remaining units divide load on the basis of economic loading. Two controls are an "on-off" switch which places the generating unit panel in service and a pilot light to indicate that the generating unit is in service.

Variables for each generating unit, such as incremental heat rate curve, back pressure correction factors, and load-limiting devices, are built into a 50-terminal plug-in box. These, mounted on the rear of the subpanel of each generating panel unit, consist of fixed resistors and capacitors wired to represent the variables electrically. Each plug-in unit is interchangeable and, with proper calibration and dials, allows a "standard" generating panel to represent the individual characteristics of any generating unit. Thus, the economics of proposed generating additions on a simulated in-service basis may be investigated readily at low cost.

Any number of generating units may be accommodated simply by adding generator panels. No change in the control equipment is necessary. Two of the three blank panels will be occupied when the first two units of the new Cherokee station are completed.

Addition of a third cabinet to house ten generator panels is contemplated, so that the control cabinet of the EGAD will be flanked by two ten-panel cabinets. As older machines are retired, the basic generator panel can be used for a new one by the addition of a plug-in unit and proper calibrations and dials.

As some 70% of the load is concentrated and served by three stations interconnected by short transmission ties, with the least efficient station farthest, incremental transmission losses are not a problem. No provision has been made in the EGAD for recognizing them although such a feature can be added. Three blank panels in the control cabinet will be used for the incremental transmission loss penalty factor control equipment.

Replacements Few

Hydro generation and interchanged or purchased power entering the system are not considered in the economic dispatch. Should their costs become significant or variable, they can be set into a generator-type panel.

The EGAD has needed only minor adjustments. In six months of equivalent service life, the device has needed replacement of only one vacuum tube and one burnishing of relay contacts.

Although not physically connected to the power system or other control equipment, the EGAD could be modified to operate automatically as a direct load-control device actuating the turbine generators, as computation of generator assignment results from "raise"

GENERATION PANEL shows details described in the text. Dispatcher sets variables associated with individual machines by adjustment of controls. Ten such panels, each representing generating unit, are in standard relay cabinet

and "lower" impulses. In service, the EGAD is kept set for the system load. Load control equipment is supervised constantly from the guidance it provides the dispatcher. Each of the three generating stations is controlled as a station unit from the central dispatching point by conventional load control equipment. The proper generation assignment within the stations cannot be controlled directly by the dispatcher, but must be set locally.

Computes Quickly

The dispatcher sets the desired maximum and minimum load range for each generating unit by turning range dials to appropriate megawatt settings. Fuel cost is set by turning the proper dial to the correct cost for the fuel fired for each unit. Turbine back pressure for the load range is checked by communication with the stations and is set by the back pressure dial for each unit. These settings exhaust the 'knowns."

Energy sources other than generators are set into the control panel as a component of total system load not in the economic dispatch. System load on the EGAD is adjusted to correspond to the actual load, and the economic dispatch is read out by depressing keys associated with each generator. Economic dispatch for any complement of sources or any estimate of total system load can be computed quickly.

Dial settings for the system load changes are few as load ranges are firm. Fuel cost settings change only when the type of fuel is changed. When fuel price changes significantly, the new price becomes the base fuel cost. Back pressure settings are made for significant changes in condensing water inlet temperatures, but need not be checked hourly. Whenever a fixed assignment of load is made on any unit, the dispatcher checks the back pressure.

Significance on back pressure in the economic dispatch frequently is overlooked. Changes in the heat rate in the 1 to 4% range generally are applicable. The penalty for high temperature on older units may exceed 6%.

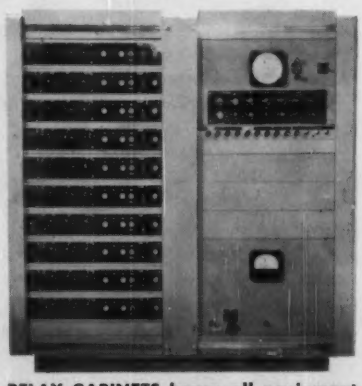
Constant surveillance of operations by the EGAD may be evaluated as small fractions of a mill per kwhr generated. This recognizes the dispatching results achieved on the system previously. With the addition of new generating units, the economic dispatch will present new complications, and the EGAD will provide guidance.

Planning studies are practicable by simulating system operations, following system load curves as projected for any period and reading the incremental costs of energy for the projected loads. Planners, using manufacturers' input-output curves for turbogenerators, can predict with reasonable accuracy the operating pressures and capabilities.

Incremental heat rate curves may be represented for the several generating units under investigation through plug-in units, and the system may be operated on the EGAD over the projected system load curves. The most economic unit to be added can be evaluated by comparing the resulting direct computations of incremental energy costs. This simulated economic loading of proposed units permits fuel costs to be weighed against fixed charges and maintenance penalties over the period of study on a basis representing predicted operation.

Long-term economic results on marginal situations will assist in a decision between higher operating pressures and larger units compared with less efficient units at lower investment per unit of capability. This is a particularly important and timely consideration unless the system can be so operated that off-peak loading on the larger generating units presents no problems and will incur no operating penalties. Spinning reserve instantly computed by the EGAD for any loading problem assists in the scheduling of the economic dispatch during the study.

CONSTANTS used in computations are built into 50-terminal plug-in boxes



RELAY CABINETS house all equipment. Panels represent 10 generating units

PROPER CIRCUIT EQUIPMENT is a "must" for any well-lighted street, and the full line manufactured by G.E. meets all system requirements.

Reliable, job-matched control equipment backs every General Electric street lighting system

In the over-all solution to your street lighting problems, the matter of proper control and protection is a major consideration. And General Electric is prepared to meet your exact needs with a full line of modern, dependable, efficient circuit equipment.

Selection of control equipment depends on such factors as type of light source, use of series or multiple circuits, whether overhead or underground wiring is available, etc. For each combination of these and many other factors, General Electric engineers have both the equipment and experience to develop control systems exactly suited to your job.

And because General Electric is a full-line street lighting manufacturer—not restricted to one type of system—the advice you get will be impartial—based on engineering and economic facts!

VISION-ENGINEERED SYSTEMS

Let G.E. help your street lighting program on a ***vision-engineered system*** basis. On every lighting project, regardless of type or size, General Electric offers you:

PROJECT RESPONSIBILITY—one source of supply for ***all*** your street lighting needs. This includes complete lines of filament, mercury, and fluorescent luminaires as well as control equipment.

COMPLETE ENGINEERING ASSISTANCE—expert start-to-finish aid from field and factory lighting specialists.

RESEARCH LEADERSHIP—the industry's newest and most complete laboratory, development, and proving facilities are located at General Electric's "Outdoor Lighting Center of the World" in Hendersonville, N. C.

Get the full ***vision-engineered system*** story from your nearest Apparatus Sales Office or authorized agent! General Electric Co., Schenectady, N.Y.

LIVE BETTER ELECTRICALLY

452-168

VISION-ENGINEERED STREET LIGHTING SYSTEMS

GENERAL ELECTRIC

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

Transformer goes 1,000 mph

In just one hour, packaging test for General Electric distribution transformers gives as much punishment as 1,000 miles of travel over roughest roads. Result: You get G-E transformers in tip-top shape.

General Electric distribution transformers arrive at your door in crates designed to help cut your transformer handling costs . . . thanks to an eight-year package-development program and use of new testing equipment.

You can practically forget damage claims with all their red tape because damage in shipment is almost nil. You also avoid the expense and nuisance of recrating and reshipping for repairs.

New test equipment proves crate toughness

At our Package Development Laboratory, Schenectady, N. Y., we thoroughly test wood, wire, and crated transformers with the most modern test equipment available today. In test at left, for example, a vibrator gives in one hour as much punishment to a crated transformer as it would receive in 1,000 miles of travel over the roughest roads. In another test a different machine gives the crated transformer an impact equivalent to freight-car "humping" at eleven miles per hour.

Crate design conserves floor space, simplifies stacking

Warehouse men can conserve floor space because G-E crates permit stacking of transformers up to four high . . . can simplify handling because one lift truck can move as many as four transformers at a time.

Linemen save time because the transformers are easy to remove from the crates. A pair of snips quickly cuts the wire bonds.

Wreck proves crates protect transformers

G-E distribution-transformer crates probably got their toughest test in shipment—quite unintentionally. A freight car loaded with transformers derailed and overturned enroute to the G-E warehouse at Charlotte, N. C. Expecting transformer mayhem, General Electric and railroad officials rushed to the spot. But not one transformer was even scratched!

All Transformers Are Not Alike

Engineered packaging is only one advantage of General Electric distribution transformers. Others include *Formex* wire* for reduction in tank size, *new and improved circuit breakers* for self-protected transformers, *complete warehouse stocks* to save utility inventories—evidence that all transformers are *not* alike.

For complete information contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Schenectady 5, New York. 431-51

LIVE BETTER ELECTRICALLY

*Reg. Trademark of General Electric Co.

STACKED TWO HIGH on finger-lift truck, four crated transformers can be easily moved, loaded, and unloaded in minimum time.

IMPACT TEST, the equivalent to a freight-car "humping" at eleven miles per hour is given to crated transformer—without damage.

Progress Is Our Most Important Product

GENERAL ELECTRIC

DISTRIBUTION—Design

Brackets Cut Transformer Installation Costs

E. J. O'CONNOR, Engineer, System Distribution Engineering, Florida Power Corp, St. Petersburg, Fla.

Three steel brackets for mounting transformers on poles have been developed by Florida Power Corp. Use of the brackets reduces costs, provides greater electrical clearances, and minimizes eccentric loading on the pole.

Two of the cluster-mounting brackets are for holding three transformers—one handles transformers up to and including 25 kva, and the other up to 100 kva. The third bracket is for mounting two transformers, each up to 50 kva.

Ring Aids Lifting

One of the three-transformer brackets, the 17-J, has a main vertical member of 6-in. 8.2-lb channel welded to other members of 4-in. 5.4-lb channel. Holes in the bracket are spaced to match the mountings of EEI-NEMA standard distribution transformers. A ring of ⅝-in. dia stock is welded to the top of the main member to facilitate lifting. The complete bracket, weighing 100 lb, is hot-dipped galvanized after fabrication.

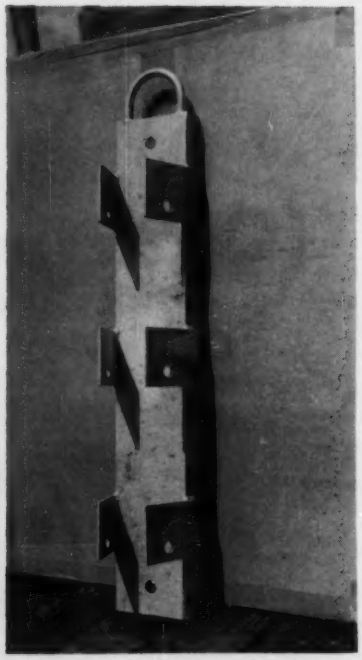
Material cost for the 17-J with hardware is $29, compared with $52 for crossarm and T-hanger mounting. But of greater importance is the saving of two to three crew hours per installation.

Holds Three 50-Kva Units

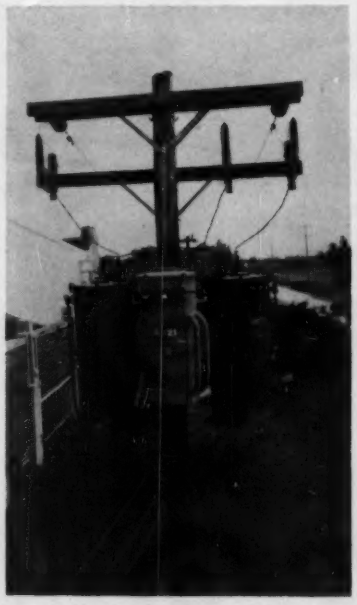
A reinforced model was developed as a result of some bending of the lower extremities of the 17-J holding three 50-kva transformers. The side vertical and horizontal members were increased in size to 6-in. 8.2-lb channel. This reinforced bracket, the 17-J-2, is now being installed with three 50-kva transformers as standard construction. Usually, larger banks are mounted on three-pole structures because of soil bearing conditions in the Florida sand. But three

(Continued on page 98)

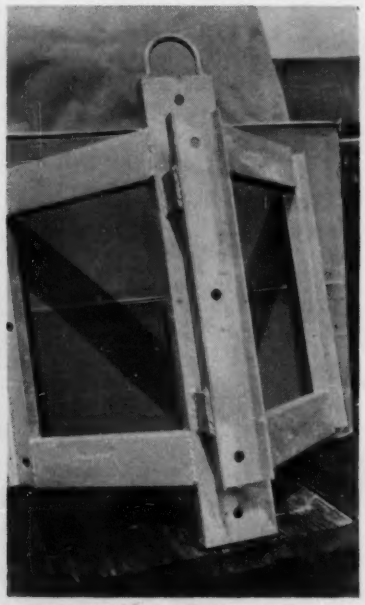
TWO TRANSFORMERS are mounted on distribution pole by means of bracket



BRACKET (17-J) has welded ring at top of main member to aid in lifting



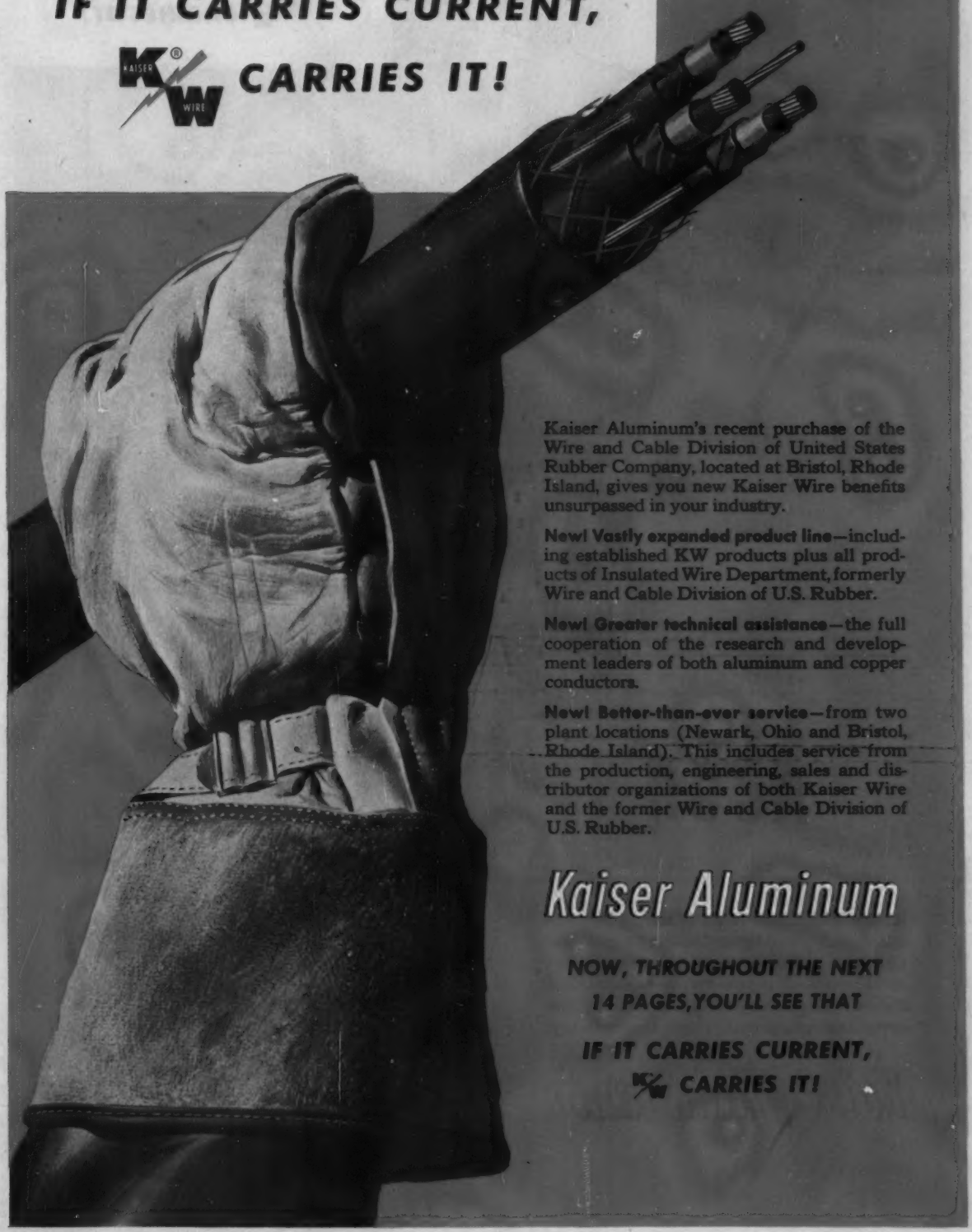
THREE TRANSFORMERS are mounted on a distribution pole with the bracket



REINFORCED BRACKET can hold three 50-kva transformers, as shown left

IF IT CARRIES CURRENT,

KAISER KW WIRE CARRIES IT!



Kaiser Aluminum's recent purchase of the Wire and Cable Division of United States Rubber Company, located at Bristol, Rhode Island, gives you new Kaiser Wire benefits unsurpassed in your industry.

New! Vastly expanded product line—including established KW products plus all products of Insulated Wire Department, formerly Wire and Cable Division of U.S. Rubber.

New! Greater technical assistance—the full cooperation of the research and development leaders of both aluminum and copper conductors.

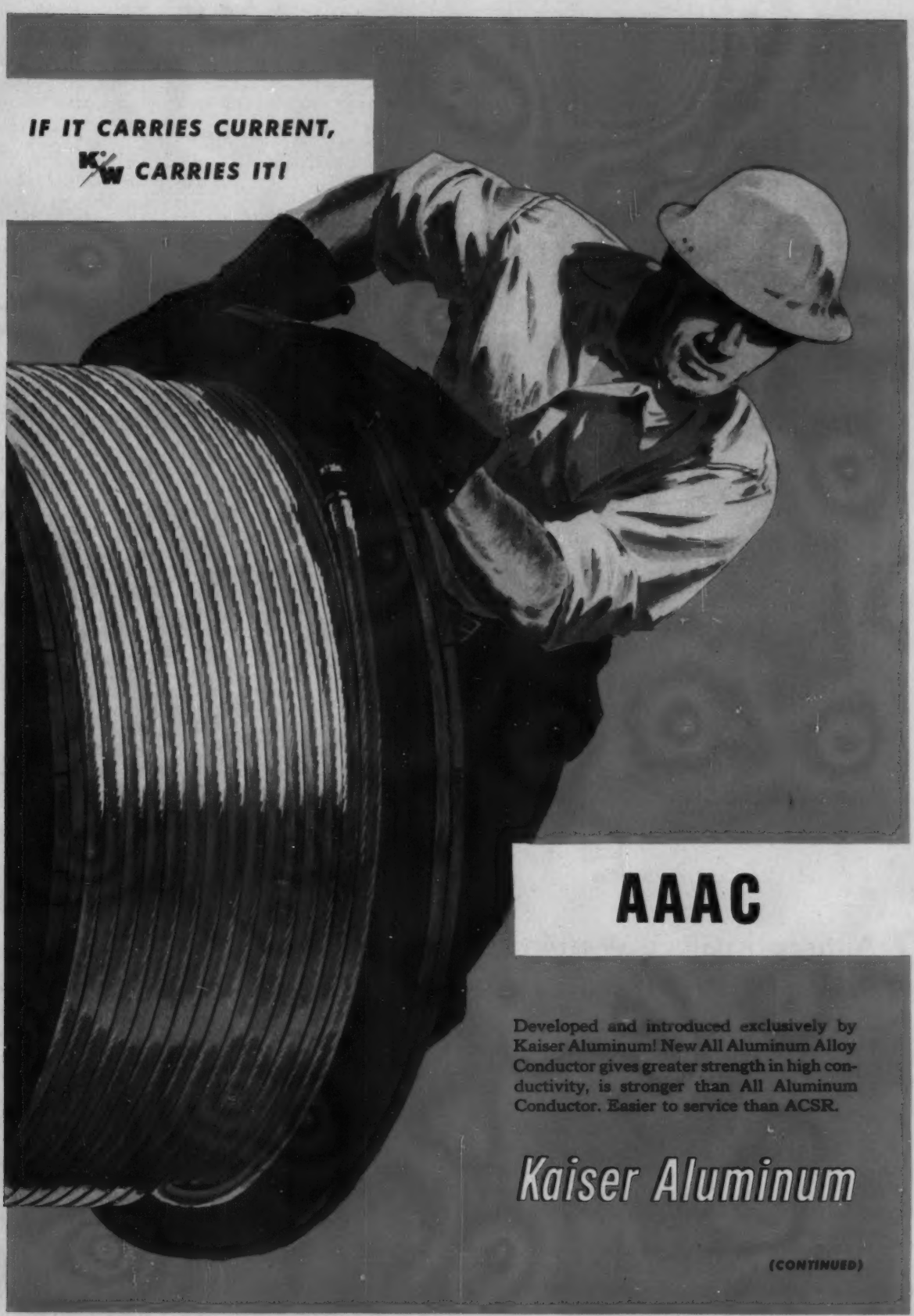
New! Better-than-ever service—from two plant locations (Newark, Ohio and Bristol, Rhode Island). This includes service from the production, engineering, sales and distributor organizations of both Kaiser Wire and the former Wire and Cable Division of U.S. Rubber.

Kaiser Aluminum

NOW, THROUGHOUT THE NEXT 14 PAGES, YOU'LL SEE THAT

IF IT CARRIES CURRENT, KW CARRIES IT!

IF IT CARRIES CURRENT,
K/W CARRIES IT!
ACSR
Kaiser Aluminum cable is unsurpassed in quality... backed by engineering experience and manufacturing abilities that can meet or exceed your toughest requirements. Put Kaiser Aluminum's growing leadership in the extra high-voltage field to work for you today!
Kaiser Aluminum


IF IT CARRIES CURRENT,
K/W CARRIES IT!
AAAC
Developed and introduced exclusively by Kaiser Aluminum! New All Aluminum Alloy Conductor gives greater strength in high conductivity, is stronger than All Aluminum Conductor. Easier to service than ACSR.
Kaiser Aluminum
(CONTINUED)

Brackets Cut Costs

(Continued from page 94)

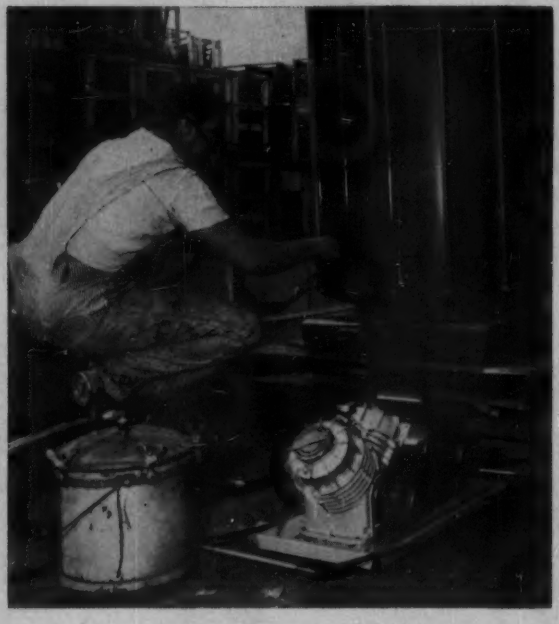
100-kva transformers have been mounted on the 17-J-2 bracket by installing a Class 1 or 2 pole and additional bearing aids.

Design of the dual mounting bracket, the 17-J-1, resulted from the need for a cheaper bracket to handle open-delta banks for home air conditioning and other 3-phase small loads. The 17-J-1 consists of a 6-in. 8.2-lb channel to which is welded six formed plates. Mounting holes in these plates are spaced to EEI-NEMA standards but are lower than the center of the plate to permit flush mounting of larger transformers.

This 35-lb bracket costs about $10, provides a more symmetrical installation, and is easier to handle than the larger ones. Transformers of smaller sizes can be mounted on the 17-J-1, completely wired, and then hoisted up the pole, when existing secondary does not interfere.

Take Bolts

All three brackets are attached to the pole with ¾-in. machine bolts. Transformers are secured with ⅝-in. or ¾-in. bolts. All brackets have provision for a grounding lug at the lower end.



DISTRIBUTION—Maintenance

Pressure Cooker Pot Saves On Transformer Paint Job

A 3-gal pressure cooker pot, similar to those formerly used for home canning, is used as the paint container and pressure tank for a spray outfit in the Renton, Wash., transformer repair shop of the Puget Sound Power & Light Co.

Used with a ½-hp air compressor developing 50 lb pressure, it has three hose fittings entering the lid—one from the air compressor and two from the paint gun.

One of the paint gun lines has a pipe fitted on the inside so that it dips down into the paint.

Bud Greimes, shop supervisor, bought the cooker pot at a junk shop for $2. According to him, the cooker pot works as well as a regular paint pressure tank which costs $35.

SAFETY

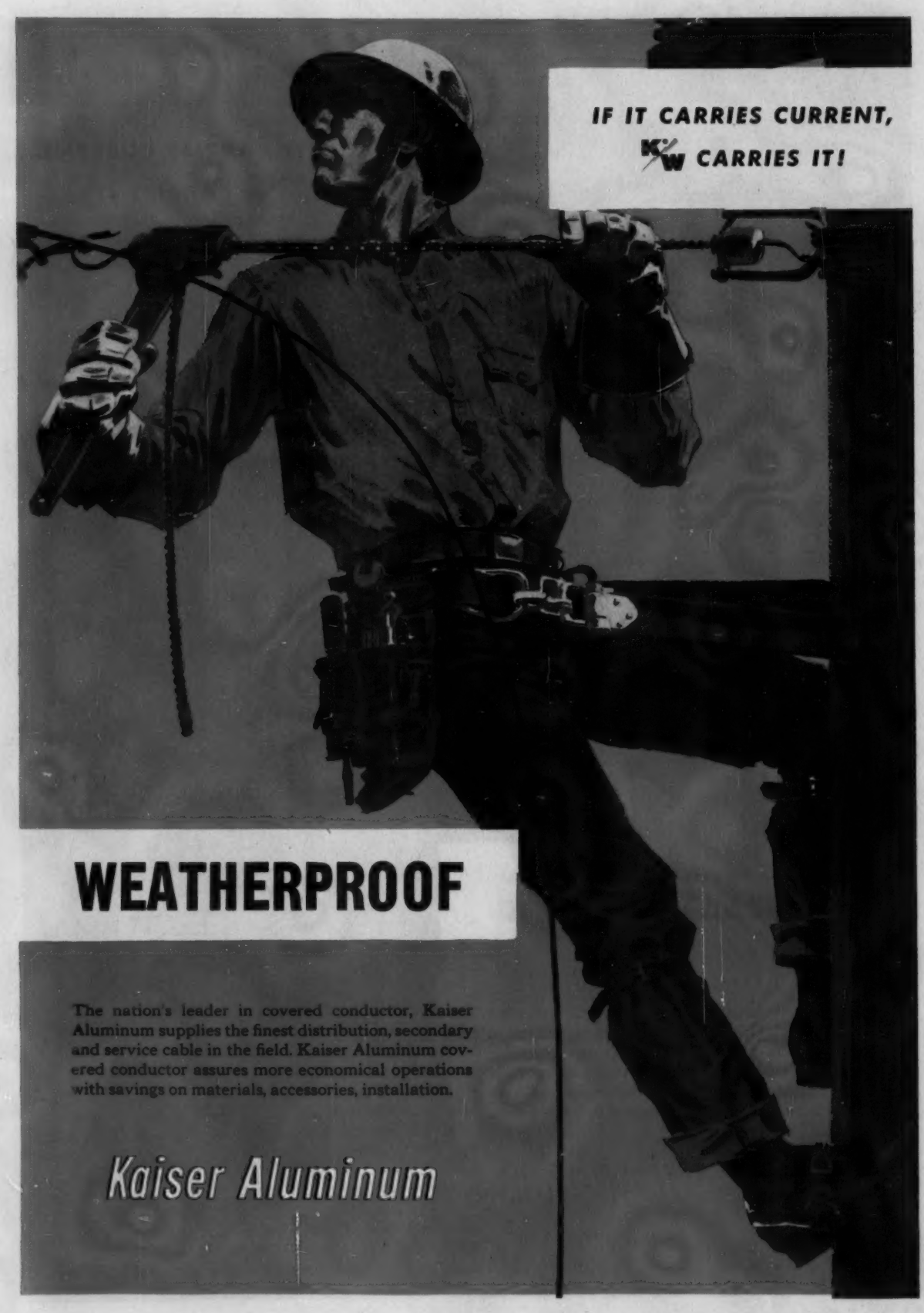
Antiseptic Glove Washing Prevents Hand Diseases

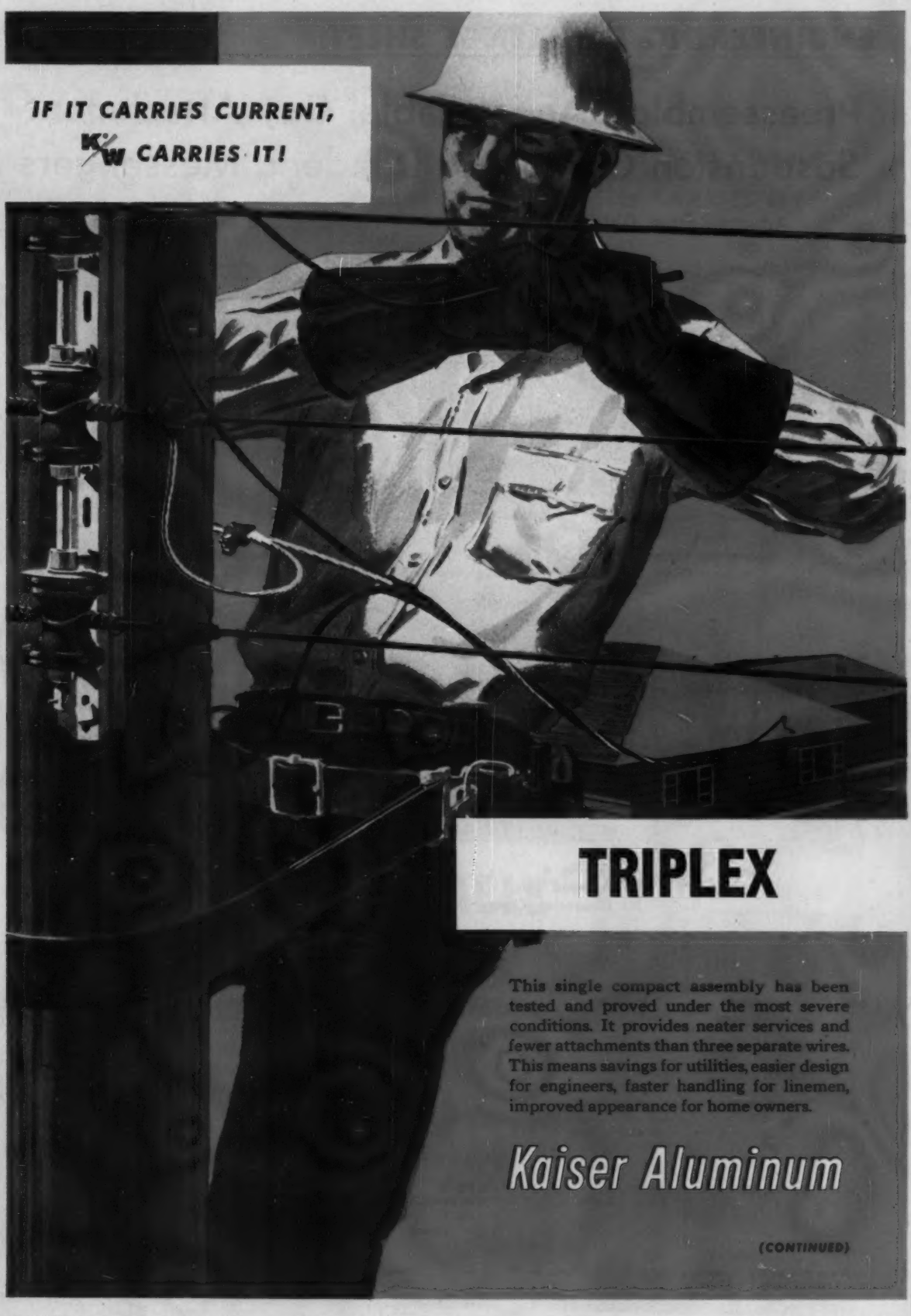
Antiseptic washing of rubber gloves protects hands from skin diseases, thus preventing possible lost man-hours. Hartford Electric Light Co has a new washing routine that is part of the monthly inspection and testing routine for rubber gloves.

Gloves sent in to the laboratory are checked off and put into an automatic washer of the rubber-tub type along with tincture of green soap, which does not affect rubber. The first rinse contains a disinfectant such as is used in hospitals. Then follows a rinse in clear water.

After washing, gloves are visually inspected and given a dielectric test up to 10-kv. Gloves passing this test are powdered with soapstone to make them less sticky. When paired, they are ready for re-distribution.

IF IT CARRIES CURRENT,
K/W CARRIES IT!
POWER CABLE
Proved the most rugged cable in the business in a special High Ozone Attack test under excessive voltage: Kaiser Wire Power Cable was still going strong after 6000 hours, while twenty-six competitive cables made by nine other manufacturers failed in time periods of from zero to 2,509 hours.
Kaiser Aluminum
(CONTINUED)


IF IT CARRIES CURRENT,
K/W CARRIES IT!
WEATHERPROOF
The nation's leader in covered conductor, Kaiser Aluminum supplies the finest distribution, secondary and service cable in the field. Kaiser Aluminum covered conductor assures more economical operations with savings on materials, accessories, installation.
Kaiser Aluminum


IF IT CARRIES CURRENT,
K/W CARRIES IT!
TRIPLEX
This single compact assembly has been tested and proved under the most severe conditions. It provides neater services and fewer attachments than three separate wires. This means savings for utilities, easier design for engineers, faster handling for linemen, improved appearance for home owners.
Kaiser Aluminum
(CONTINUED)

Preassembled Aerial Cable: Guy Attachment, Suspension Clamp and Deadend Messengers

Adapted from Distribution Standards of New England Electric System

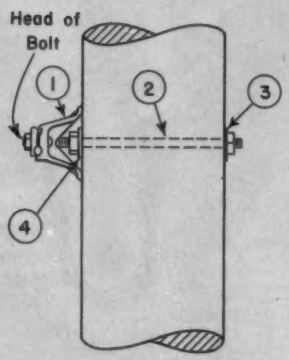


Fig 1
Suspension Clamp, without Guy

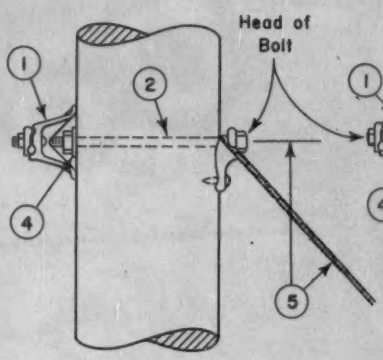


Fig 2
Suspension Clamp, with Guy Attached

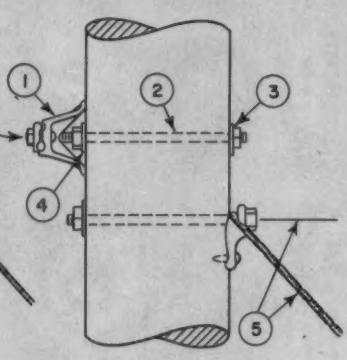


Fig 3
Suspension Clamp with Separate Guy

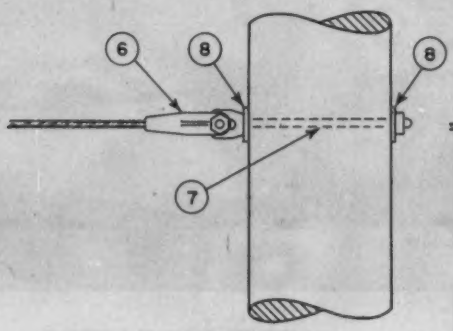


Fig 4
Deadend only; No Suspension Clamp

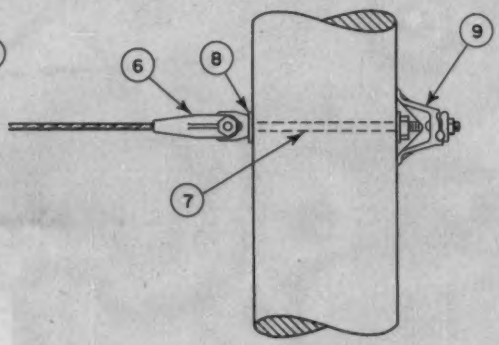


Fig 5
Deadend with Suspension Clamp

MATERIAL LIST

Item	Suspending Cable Material	Description		Item	Deadending Messengers Material	Description
1	Suspension clamp	Small*	Large†	6	Messenger deadend	For 3/8 in. messenger For 1/2 in. messenger
2	Thru-bolt	5/8-in. x (..)‡	3/4-in. x (..)‡	7	Eye-bolt	5/8 in. for 3/8-in. messenger
3	Washer, square	11/16 x 2 1/4 in.	.....			3/4 in. for 1/2-in. messenger
4	Washer, square	11/16 x 2 1/4 in. and extra 5/8-in. nut against face of pole	.....	8	Washer, square	11/16 x 2 1/4 in. for 5/8 in. bolts
	curved	.....	13/16 x 13 in.		curved	13/16 x 3 in. for 3/4 in. bolts
5	Std guy, 6M&10M	Use Fig. 2; 5/8 in. eye-bolt	Use Fig. 3; 5/8 in. thru-bolt	9	Suspension clamp Standard guy	See Item 1 See Notes ⊙ & X
	16M	Use Fig. 3; 3/4 in. thru-bolt	Use Fig. 2; 3/4 in. eye-bolt			

* Small size used for 3/8 in messenger and angles 0 to 45 deg, also for 1/2 in messenger and angles 0 to 30 deg

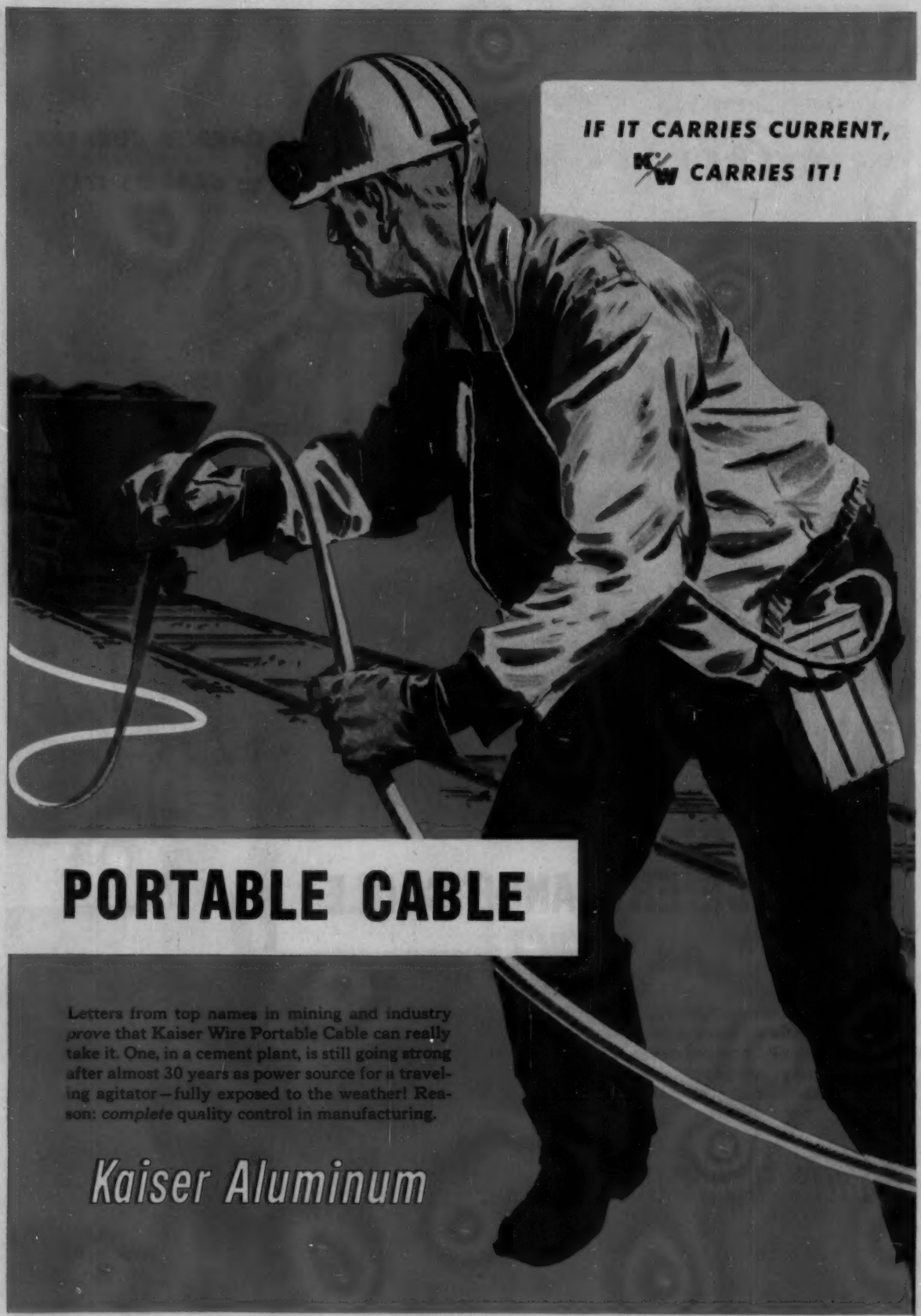
† Large size used for 1/2-in messenger and angles 30 to 45 deg

‡ Length determined by pole diameter

⊙ Fig 4—Use standard guy when required, attached to end of deadend eye-bolt

x Fig 5—Use standard guy when required, attached separately and near deadend

IF IT CARRIES CURRENT,
K/W CARRIES IT!
SERVICE ENTRANCE CABLE
New UL-approved Kaiser Aluminum Service Entrance Cable is now available for 75° wet applications! Improved design characteristics—including pleasing appearance and ease of application—make this cable your best buy.
Kaiser Aluminum
(CONTINUED)


IF IT CARRIES CURRENT,
K/W CARRIES IT!
PORTABLE CABLE
Letters from top names in mining and industry *prove* that Kaiser Wire Portable Cable can really take it. One, in a cement plant, is still going strong after almost 30 years as power source for a traveling agitator—fully exposed to the weather! Reason: *complete* quality control in manufacturing.
Kaiser Aluminum

IF IT CARRIES CURRENT,
K&W CARRIES IT!
PORTABLE CORD
More than 12,000 tests conducted over a 3-year period prove this one cash-saving fact: *Kaiser Wire Portable Cord gives three times longer life than the average of molded cords of other makes.* They're well worth the few extra pennies you pay per foot!
Kaiser Aluminum
(CONTINUED)

Skyscraper Is a Commercial Cooking Bonanza

New Socony-Mobil kitchen serving 2,500 meals a day boosts load by almost 500 kw

One of the world's largest and most remarkable all-electric commercial cooking installations was completed not long ago in a new New York skyscraper. It is in the employees' restaurant of the Socony-Mobil Building on East 42nd Street.

Total connected load to Consolidated Edison's lines is almost 500 kw. Breakdown:

- Thirty-seven electrically driven refrigeration and compressor units—18.25 kw.
- Twenty-three cooking, frying, broiling and baking units—327 kw.
- Seventy-three food and plate-warming units—138.6 kw.
- Miscellaneous units, including toasters, coffee makers, electric waitress stations, etc.—11.6 kw.

At present the kitchen puts out 2,500 lunches a day. On a three-meal schedule, it can handle more than 7,500 servings.

It was designed and built by S. Blickman, Inc, of Weehawken, N. J., within the striking architectural surroundings of J. Gordon Carr of New York. Hotpoint Co supplied most of the large cooking equipment.

Even the billing at Socony-Mobil is electric. The employee fills out a machine-punch card with his menu items, and the rest is automatic. At the end of the month he gets his bill for payment.

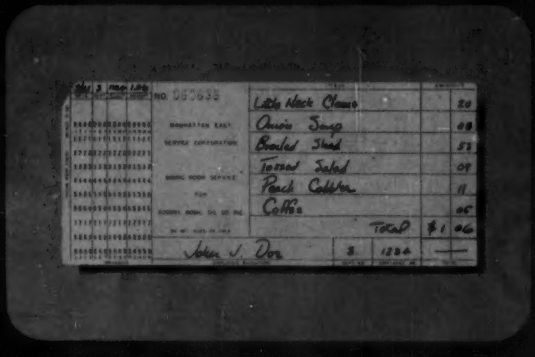
How is the all-electric kitchen to work with? Well, according to C. J. Greulich, manager, "Our chefs, who have spent most of their lives working with other than electric equipment, were wary at first. Now they're enthusiastic. They are sold on electric equipment's speed and the ease with which it can be kept clean."

(More Selling on page 108)

From cooking . . .

. . . to baking . . .

. . . to serving . . .



. . . to billing, the operation is 'all-electric'!

IF IT CARRIES CURRENT,
K/W CARRIES IT!
FIRE
CONTROL CABLE
Sixty-seven years of experience in electrical wire and cable manufacturing back up the *dependability* that is built into Kaiser Wire Control Cable. Unique Kaiser Aluminum Laytex® insulation gives you greater dielectric strength, more wires per conduit, absolute uniformity . . . in short, *proved security* for public safety.
Kaiser Aluminum
(CONTINUED)

AF Base to Put Heat Pumps in 1,535 Homes

Residences at Little Rock installation will be all-electric. $21.5-million contract was won by Arkansas P&L Co despite gas competition

Plans to build 1,535 all-electric homes for Air Force personnel at Little Rock Air Force Base, Ark., were announced by Air Force headquarters in Washington recently. The big feature of each home will be a 2-ton heat pump. The housing project is the first all-electric one to be constructed by the Air Force.

Announcement of the $21.5 million development came as the successful conclusion to months of tedious study and negotiations by Arkansas Power & Light Co officials. The AP&L team was made up of president R. E. Ritchie, vice president W. M. Shepherd, Leslie Blades, commercial sales specialist, division manager Paul Griffith, and Roy Hogan, industrial sales engineer. Together they spent most of six months compiling and submitting data that sold air force officials on the economy and efficiency of the all-electric operation.

The decision to go ahead with the all-electric homes has several important implications:

• According to Shepherd, the development "is a new milestone in the progress of all-electric living in America. This decision between gas and electricity has been extremely competitive and was finally settled on the strict basis of dollar costs. The real victory lies in the fact that electricity won the vital decision on this basis."

• This is believed to be the first time the government has used the heat pump on such an extensive basis—it has been recognized. This seems to indicate that the device, so long considered an interesting innovation, has come into its own.

In addition to the heat pump for year 'round temperature and humidity control, each home will have an all electric kitchen including range, refrigerator, dishwasher, garbage disposer, connections for washer and dryer, and a 40-gal quick recovery water heater. Each will be adequately wired and fully insulated for heating and cooking economy.

Here's an idea of what these all-electric homes will do for AP&L's load:

• Each house will require 12 times as many kwhr yearly as the average AP&L residential customer used in 1956.

• Total energy requirements will exceed that of all the residential customers in Pine Bluff (11,700) and Hot Springs (8,800) combined. The heat pumps will account for about a fifth of the load, which is expected to boost Little Rock AFB load by a maximum of 5,500 kw.

AP&L plans to gather cost data for cost-of-electric living for the average size home. Individual houses and groups of houses will be extensively metered.

"Earth-turning" date of the project was March 5th. It is expected to be completed in about 21 months.

H & C BRIEFS

New Westinghouse A.C. Plant

Westinghouse's air conditioning division has opened a factory branch at Cleveland, Ohio, it was announced recently. The Cleveland office will be responsible for wholesale operations with contractors and dealers in northeastern Ohio communities.

American Blower's Training School

American Blower, Division of American Standard, has established a commercial air conditioning school at its Detroit headquarters. The school gives application and service courses to representatives of air conditioning distributors and dealers. Unique feature is that companies sending reps need not be American Blower distributors or dealers. Address company at Detroit 32, Michigan for information.

1,350 A.C. Units in NYC Apts

Airtemp Division of Chrysler Corp is putting 1,350 all-in-wall room air conditioners in the new Coliseum Park Apartments in New York City. Units will be individually controlled in ½, ¾, and 1-hp sizes. A single wall enclosure will contain both conditioner and convector radiator.

Air Conditioning in Color

General Electric Co has introduced color styling in its line of Thinline room air conditioners. Six colors are available to make units match the decor of the room in which they are installed. Color is obtained by spraying the standard beige unit with laquers, available in self-spraying containers. Colors: Cloud Pink, Jonquil Yellow, Bittersweet Red, Desert Tan, Pine Green and Mist Gray.

Portable Heater Survey

According to an Arvin Industries, Inc, survey of portable electric heaters, 30% are used in the bathroom, 25% are for multiple use, and 16% go into bedrooms. Eight percent were for offices and stores, the balance were for miscellaneous use. The trend for offices and stores seems to be toward automatically controlled units.

(More Selling on page 110)

ACSR

AAAC

TRIPLEX

WEATHERPROOF

SERVICE ENTRANCE CABLE

BUILDING WIRE

BUS BAR

POWER CABLE

PORTABLE CABLE

PORTABLE CORD

CONTROL CABLE

OVERHEAD CABLE

INDUSTRIAL POWER AND LIGHTING CABLE

IF IT CARRIES CURRENT, KW CARRIES IT!

IMPORTANT FACTS TO REMEMBER about Kaiser Aluminum's recent purchase of the Wire and Cable Division of U.S. Rubber:

- **All** former U.S. Rubber products will continue to be produced.
- **The same** U.S. Rubber guarantees apply and will be continued.
- **The same quality** insulations and jackets formerly compounded by the Bristol Works of U.S. Rubber will continue to be used.
- **You can now buy both** aluminum and copper electrical conductor from Kaiser Aluminum.
- **The same people** who served U.S. Rubber customers before will serve them now, as a part of the Kaiser Aluminum sales organization.
- **No duplication of calls** will be necessary, because *both* former U.S. Rubber representatives and Kaiser Aluminum representatives can present complete line.
- **Distributor outlets,** whether handling former U.S. Rubber products or Kaiser Aluminum, will remain unchanged.
- **Technical assistance** available to you will be greatly increased as the result of the addition of highly skilled U.S. Rubber personnel to Kaiser Aluminum's industry-leading research and product development departments.
- **Delivery service** will be even faster and more efficient due to new eastern plant location, new representatives and additional distributors.

For immediate attention to any request for electrical conductor products, engineering and research service, or further information, contact your nearest Kaiser Aluminum sales office or the KW distributor listed in your telephone directory.

Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Bldg., Oakland 12, California; *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois. *Headquarters Office Bristol Products*, 1230 Avenue of the Americas, New York, N. Y.

Kaiser Aluminum

the bright star of metals

See "THE KAISER ALUMINUM HOUR." Alternate Tuesdays, NBC Network. Consult your local TV listing.

Conveyorized system in Idaho potato plant . . .

Pares Costs, Reduces Losses

BURTON C. MARTIN, Commercial Consultant, Utah Power & Light Co, Preston, Idaho

Electrification of the processing line has eliminated manual handling of potatoes for Western Potato Co at its plant near Roberts, Idaho. Labor costs have been cut 20% and damage to potatoes has been reduced by at least 10%. The electrified line takes potatoes by conveyor from bulk trucks through sorters to the desired sack size, and then directly to railroad cars. In one hour, up to 24,000 lb of potatoes in 10-lb sacks can be sorted and loaded into railroad cars. The line uses 45 electric motors ranging from ½ to 7½ hp.

The processing plant now is rated as one of the more efficient plants in the area. Before the plant was electrified, it was necessary for workmen to enter the potato pits, sack up about 100 sacks of potatoes, and load them onto a truck for delivery to the processing plant where they were unloaded manually.

Potatoes now are loaded into bulk trucks from the pits by a 1-hp conveyor. The trucks have built-in conveyors to speed unloading at the plant. Power for these conveyors is furnished by a ¼-hp motor, mounted on the truck at the rear. Trucks can be unloaded as fast as the plant conveyor bins can handle the potatoes.

From the trucks, a series of three conveyors carries potatoes to the bulker bins and then to the washing and sorting area. The washing conveyor, powered by a 3-phase, 1½-hp motor, tumbles the potatoes so that water sprayers can remove foreign material. Water for washing the potatoes and for the plant drinking supply is pumped by a 7½-hp motor.

In the sorter section, washed potatoes are handled on two conveyors along each side of the sorter. Smaller conveyors in the center of the sorter carry culls out of the plant and No. 2 potatoes to the sacker.

No. 1 potatoes pass from the sorter to reversible sacker conveyors, which feed either the 10-lb mesh bag sacker or the paper-bag sacker and the 100-lb burlap jigger. From the sackers, reversible belted conveyors carry 25, 50 and 100-lb packages of potatoes to scales and then to railroad cars.

An overhead-track conveyor above the belted conveyors carried 10-lb bags to the same loading positions opposite the railroad cars. Thus, two cars may be loaded simultaneously, each with a different or the same size of bag.

Pre-Shrinker Ups Quality, Revenue

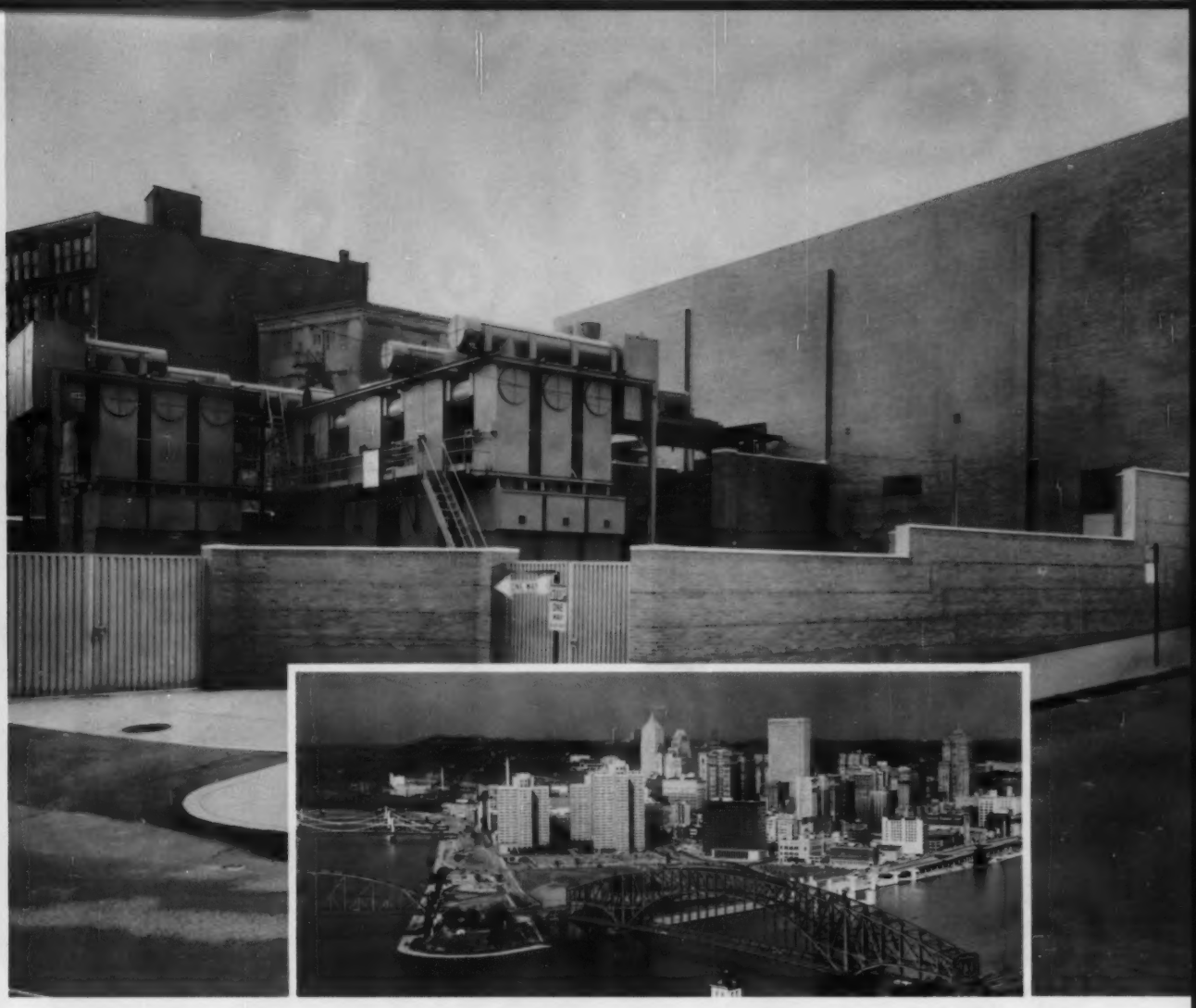
JOSEPH G. CLAPPER, Sales Representative, Pennsylvania Power & Light Co, Sinking Spring, Pa.

An electric hosiery conditioner installed at the Kissinger & Smith hosiery mill in Sinking Springs, Pa., has increased the product quality, reduced the number of rejects, and provided an extra source of revenue from subcontract work.

Since the machine was put in, subcontract work has grown to sizable proportions, now runs about 1,500 pairs per week. In addition, the number of "pullers" in the company's own hosiery production has dropped.

Normally, nylon hose shrink about three inches while being processed. The conditioner or pre-shrinker uses controlled heat and humidity to produce about 90% of the shrinkage in one pre-shrink operation. Conditioned hose are sturdier and less liable to be damaged in the remaining looping, seaming and boarding operations.

The conditioner uses two 2.5-kw automatically controlled heaters which operate from a 220-volt line. A ¼-hp motor which drives the circulating fan in the unit runs on 110 volts. The unit has a capacity of 50 dozen hose per hour but occupies only 20 sq. ft. of floor space.



FORBES SUB-STATION

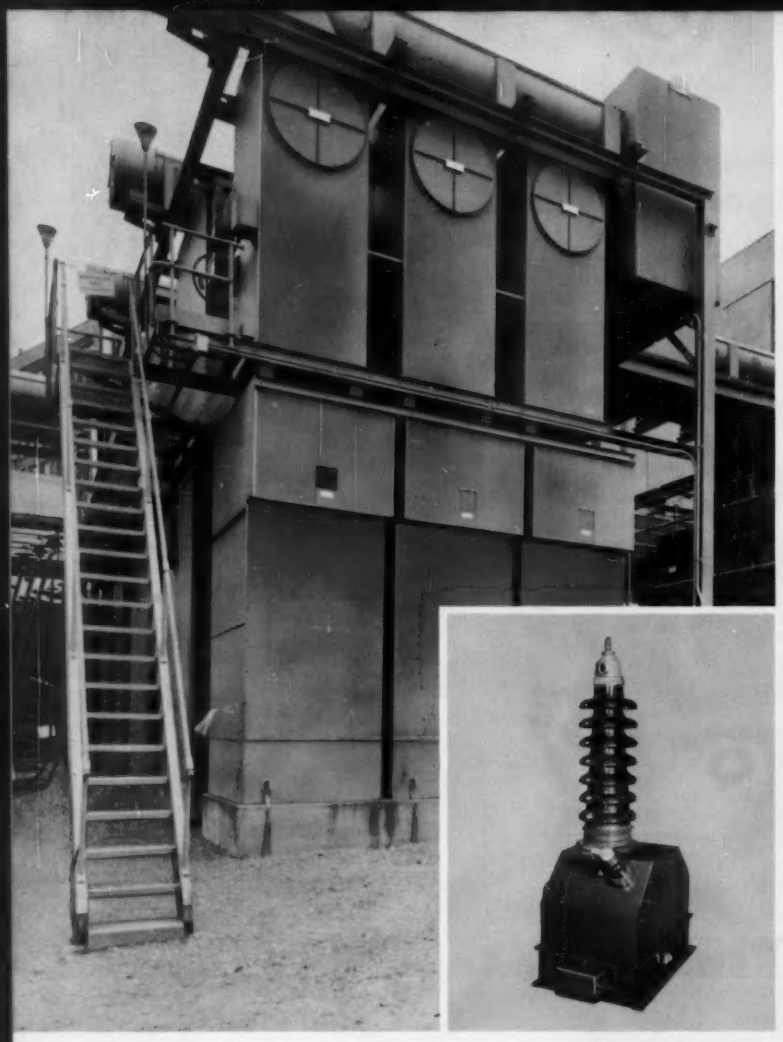
Sub for Pittsburgh's new sky line occupies one-fifth normal space

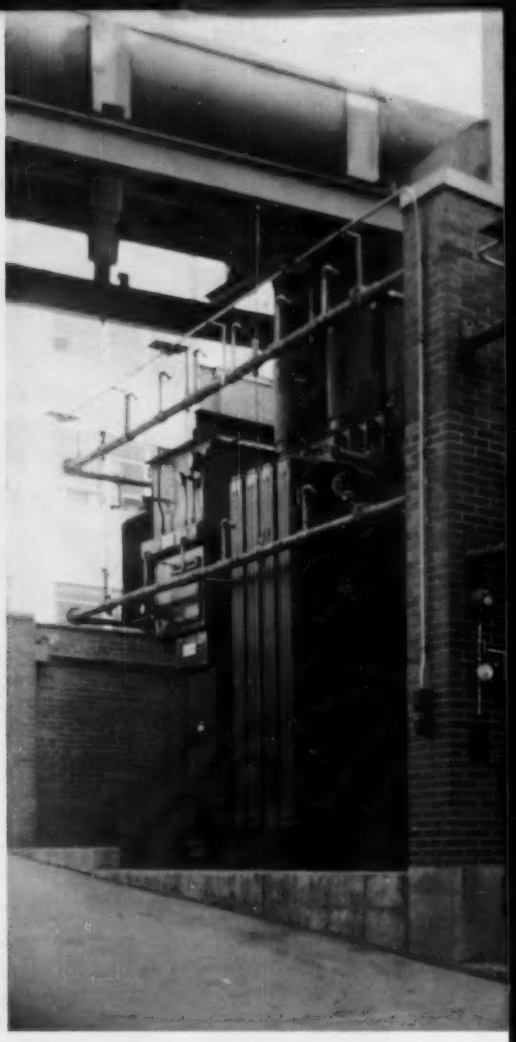
The dramatic reshaping of a new sky line in Pittsburgh has attracted national attention. But the utility industry has focused on the ingenuity exercised by Duquesne Light Company in bringing 69-kv power directly into such a congested, high-value area.

Duquesne's engineering department first conceived the idea when it became apparent that the cost to continue supplying downtown with 11.5-kv cables from nearby Brunot Island Station was climbing out of line. The best downtown location available to terminate 69-kv transmission was high-value land, totaling only 17,000 square feet . . . for a station which, if built as a conventional outdoor sub-station, would require up to 75,000! Duquesne's engineers diagramed the sub-station, submitted the idea to Westinghouse and jointly they worked out specifications for standardized equipment.

How this problem was solved, and Forbes Sub-Station erected, is detailed on the following pages.

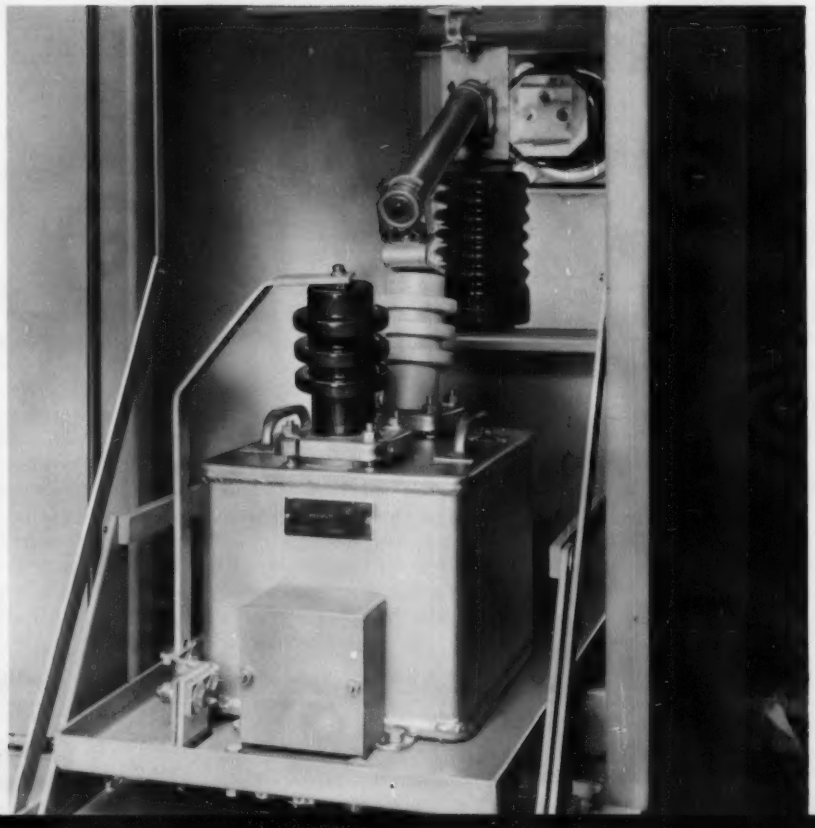
YOU CAN BE SURE... IF IT'S Westinghouse

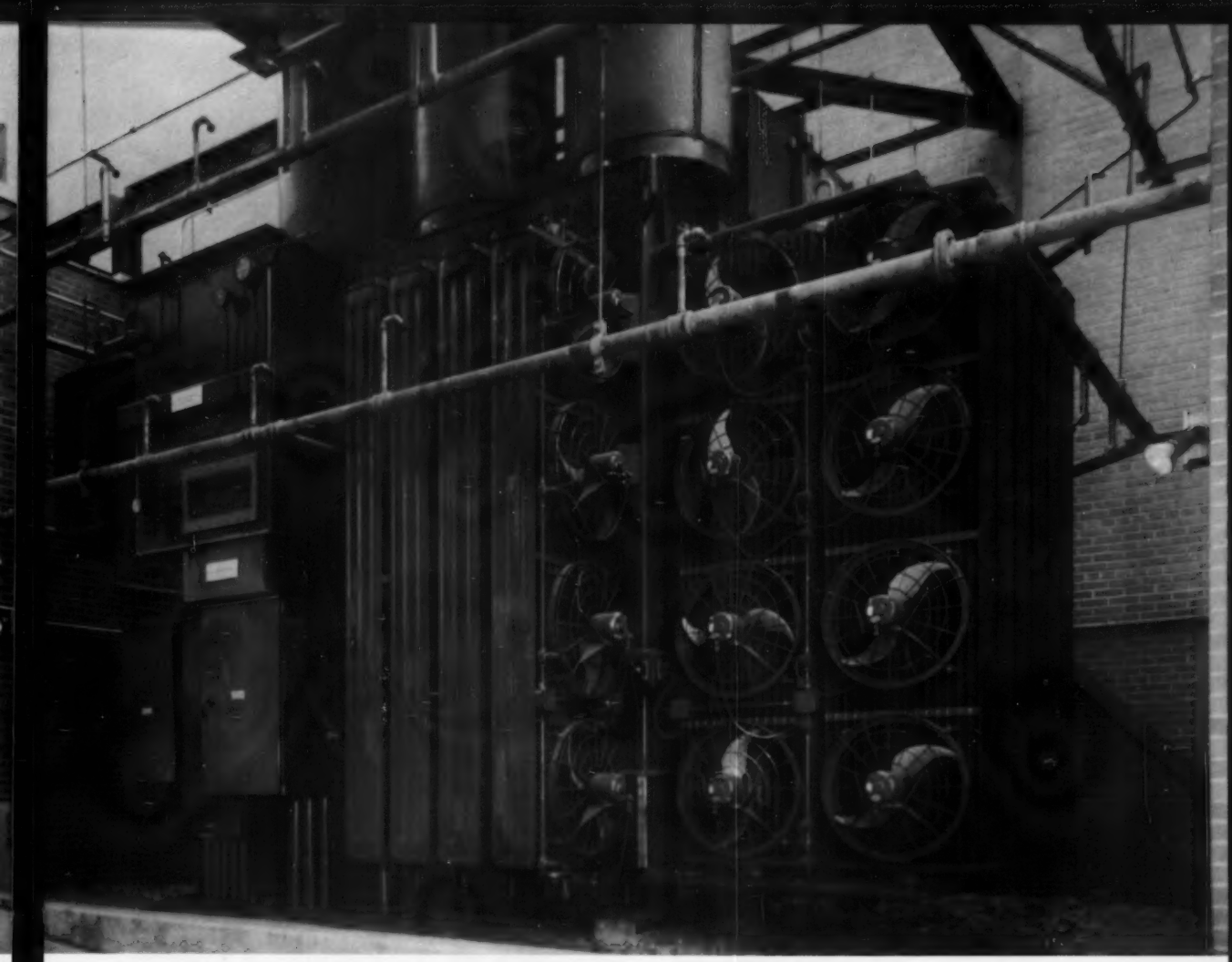




Compartment at top right of structure shows where 41,570/-69.28-volt nonflammable liquid insulated potential transformers (inset) were installed adjacent to overhead bus.

11.5-kv fused potential transformers with drawout disconnects serve to measure voltage on all three phases feeding switchhouse and two phases of each outgoing service to downtown networks.





Main power transformers are 30,000-40,000-kva air blast. Exclusive Westinghouse Form-Fit design contributed to compactness of station layout. In addition, 225-kva type SL station service transformers were mounted piggyback, with direct throat connection.

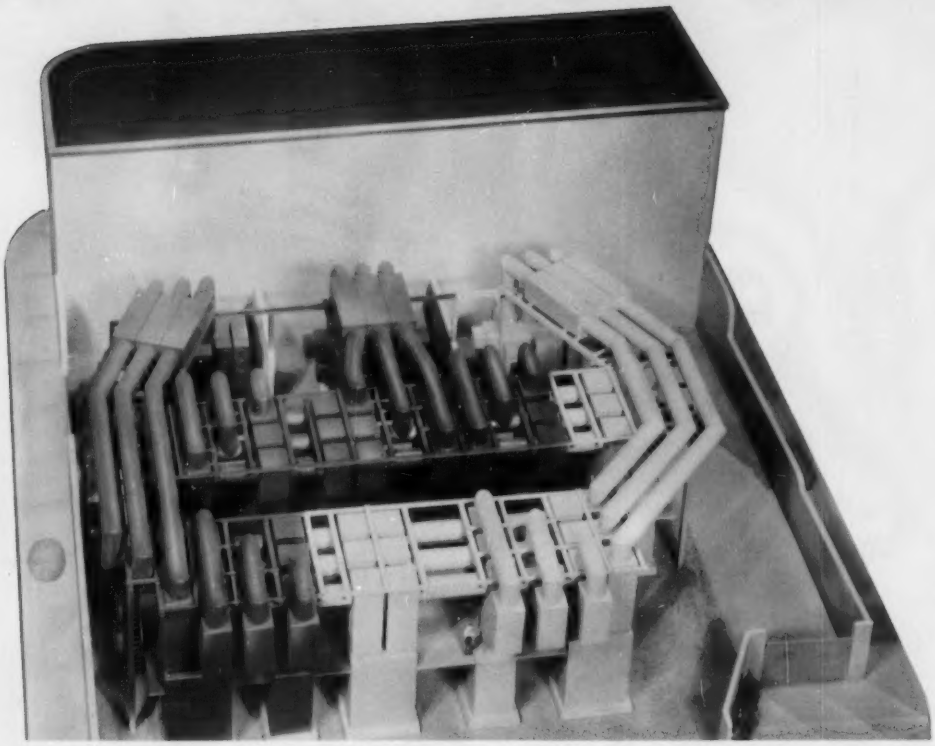
Unique transformer arrangement saves valuable space at Forbes

To shoehorn this high-capacity sub-station into one-fifth the normal space, maintain clearances and safety standards, called for a high degree of ingenuity.

Westinghouse Form-Fit® transformers, with their savings in bulk of 15% over comparable designs, contributed substantially to compactness, as the illustration above shows. But a 15% gain, when you're trying for better than 75%, is just one good step along the way.

To make the necessary additional gains, station service transformers were allocated "no space," mounted piggyback with direct throat connection to the main transformers. 69-kv potential transformers got the "no-space" treatment by mounting them in compartments along the overhead bus. Neutral resistors took full advantage of the wedge of open area between side and rear banks of radiators on main power transformers. In every single case, the compactness and lightness of Westinghouse transformer design simplified the spacesaving problem.

YOU CAN BE SURE...IF IT'S Westinghouse



Model illustrates compactness of Forbes Sub-Station layout. Three-story switchhouse is at rear. Dark indicates present installation; light, future expansion.

How Westinghouse bus, switches and breakers solved 69-kv clearance problems

For maximum dependability, within the clearances possible, isolated phase bus seemed the only choice for interconnection . . . but, at 69 kv, how much clearance? How much dependability?

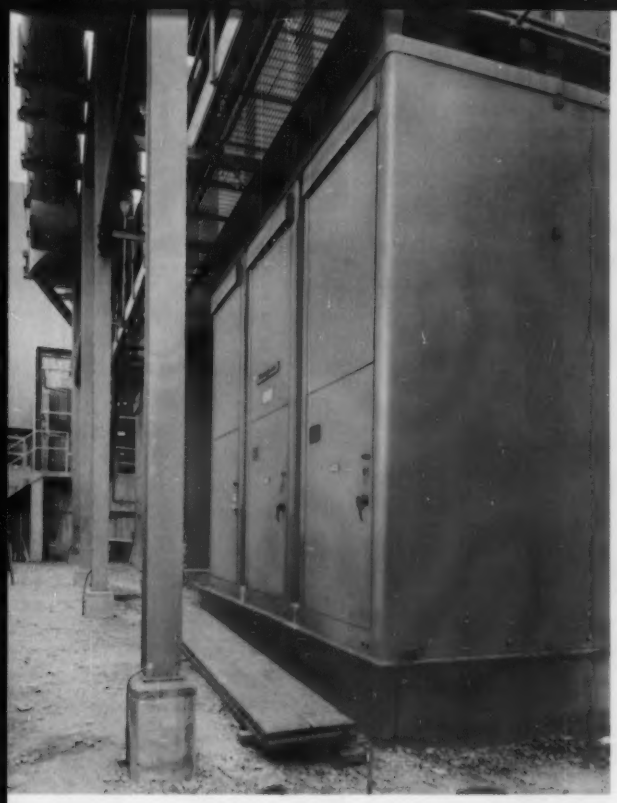
By actual tests, Westinghouse proved their design with enclosures of 38″ ID provided clearances adequate for the standard 350-kv BIL.

Similar problems arose with enclosed disconnect switches. The advantages of telescoping switches were recognized, but none had ever been built with a 69-kv rating. Basic Westinghouse electrical design was approved with the addition of a safety-check light box and viewing window by Duquesne engineers.

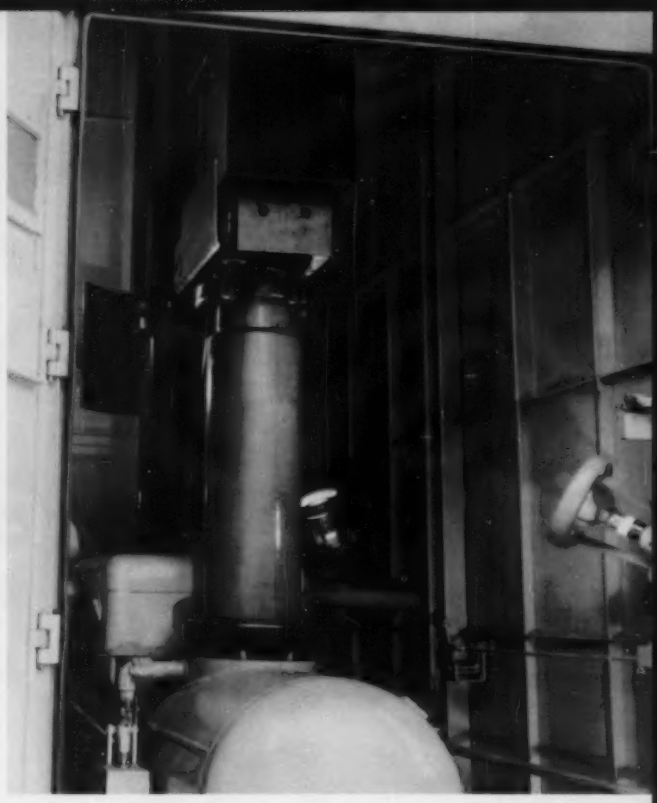
69-kv air blast breakers solved the problem of safely switching and protecting the circuit within the confines of a densely occupied area. Safe isolation of all high-voltage equipment was thus assured.

69-kv isolated phase bus connects incoming circuits, switchgear and transformers. Westinghouse bus with its enclosure of 38″ ID proved by tests that it would provide full 350-kv BIL for a 69-kv system.

YOU CAN BE SURE...IF IT'S Westinghouse



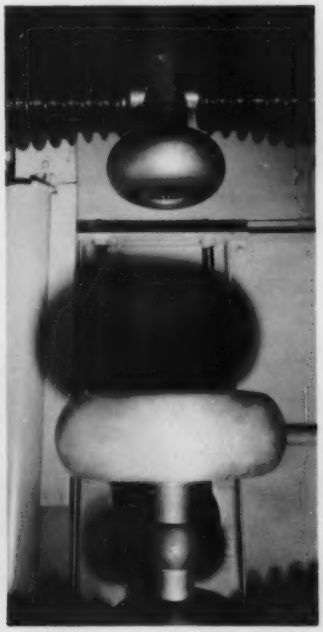
69-kv air blast breaker compartments. All breakers in the station are operated from a central air supply inside the switchhouse, eliminating necessity for individual compressors and associated maintenance.

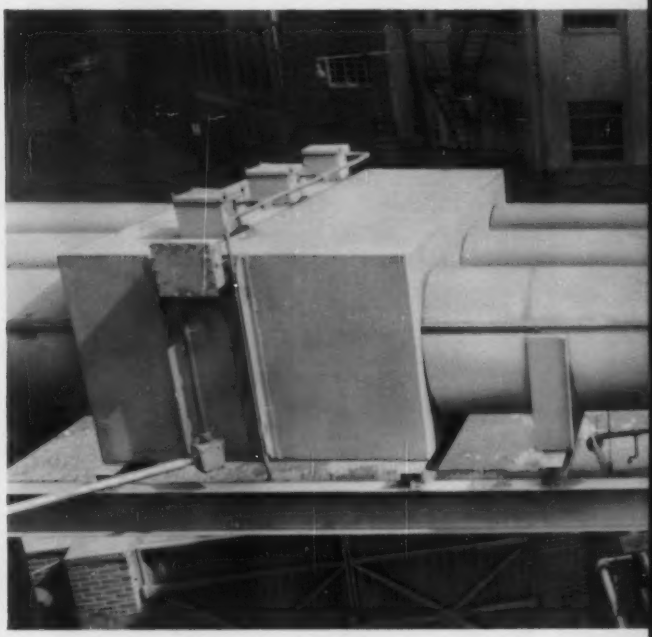


Interior view, 69-kv air breakers, rated 3500 mva, 2,000 amperes. Circuit is first interrupted in vertical chamber, top foreground. An isolating disconnect switch behind the chamber then opens while the circuit is interrupted.

Telescoping bus disconnects, a design long known to the industry, had never before been applied to voltages as high as 69 kv. Large bowl-like corona shields surround the contacts.

The disconnect switches shown are horizontally mounted. The light boxes shown on the top of this installation, together with windows on the underside, provide a quick visual check of contact position from ground level.

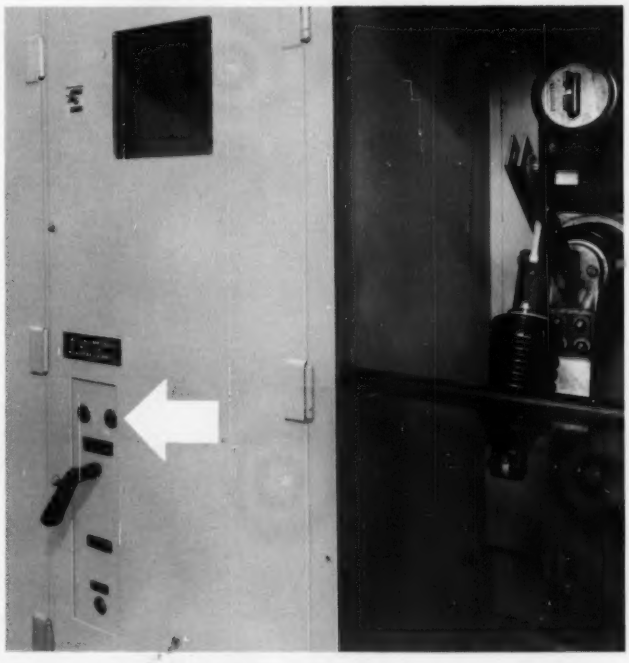




Interlocking keys assure safety of 11.5-kv station cubicles

Protection of circuits and of personnel are given equal emphasis in the new Westinghouse switchgear for the 11.5-kv lines. As breaker contacts part, air blast carries the arc upward into a breakup chute, extinguishing it and cooling any gases before they are released, assuring safe, positive circuit interruption.

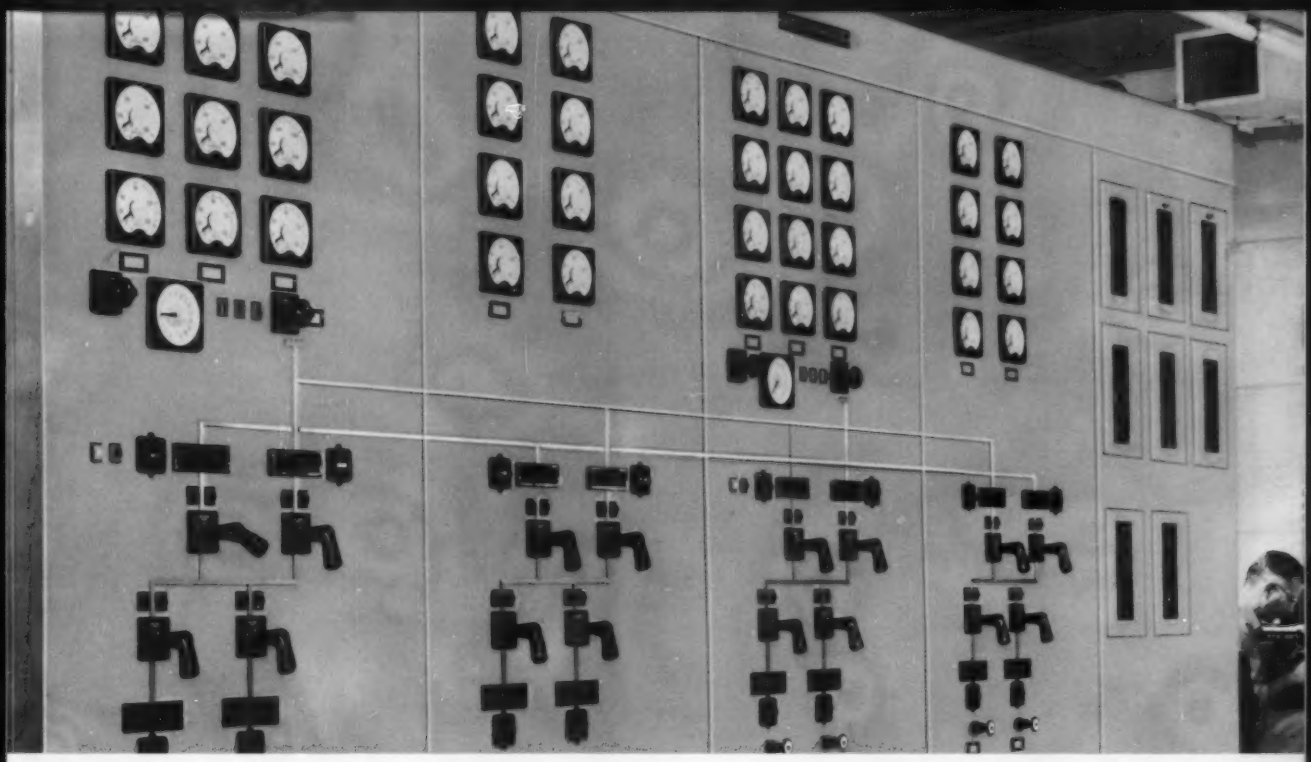
Personnel safety is guarded by interlocking keys, which make certain that dead-front doors to breakers, operating mechanism and associated disconnects can be opened only in the proper sequence, and only when equipment is in safe position, eliminating the hazard of human error.



Disconnects in back of station cubicles isolate the breakers. Mechanical interlock handle with key mechanism (arrow) assures correct operation of breaker, disconnect switches and door.

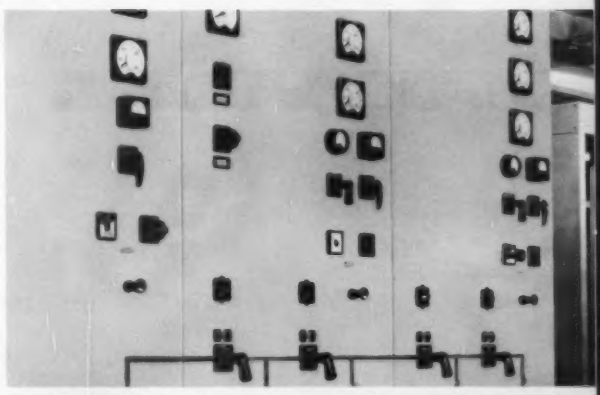
Station cubicles for 11.5-kv circuits contain 150-CA-1000 compressed air breakers. As a safety measure, doors interlock so that key (protruding above left) must be inserted and B phase opened before A and C will release. Similar key permits manual operation of breaker.

YOU CAN BE SURE... IF IT'S



These panels control 11.5-kv feeders to one downtown network area. Annunciator panel at the right reports troubles on the major equipment and each of the three groups send a signal to the dispatcher's office.

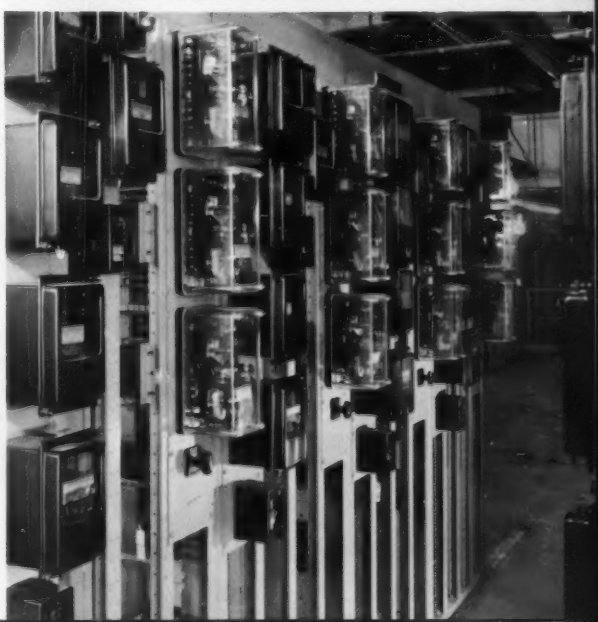
Controls for the 69-kv circuits are contained in the panels shown below. In general service, station will be unmanned, operated by remote control.



Forbes Sub-Station remote controlled

Although equipped for on-site operation from the third floor of the switchhouse, Forbes Sub-Station is designed for remote control from the system dispatcher's office located in the company's main office building, six blocks away in the heart of the downtown business district.

This floor also contains one of the most modern relay protective setups in the industry. On panels designed by Duquesne Light and fabricated by Westinghouse, CO and CA relays provide bus overload and differential protection, JD timing devices check back-up, and Type COH relays protect networks against overload.



One of the relay panels located on the third floor of the switchhouse. Westinghouse CO and CA-6 relays in the foreground provide 11.5-kv bus overload and backup protection.

Westinghouse

Frank Adkins, Westinghouse salesman, is proud of Forbes Sub-Station!

Frank Adkins has reason to glow with pride when you mention Forbes Sub-Station. From idea stage all through construction, Frank played the role of "Mr. Westinghouse" to Duquesne Light Company.

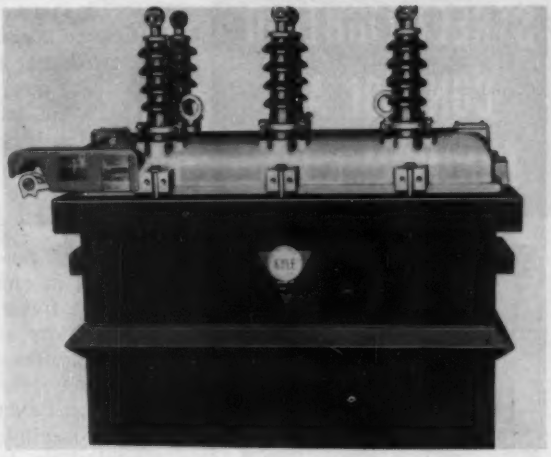
Frank takes no personal credit. He represented the hundreds of engineers, the thousands of workmen who designed and built the equipment.

"One contact, one responsibility" meant a lot to Duquesne Light during this period. That's why the men of Duquesne think highly of Frank. That's why we believe you, too, will find it advantageous to deal with the Westinghouse representatives throughout the country who can serve you as "one contact, one responsibility." C. P-1040

YOU CAN BE SURE...IF IT'S Westinghouse

NEW EQUIPMENT

Recloser

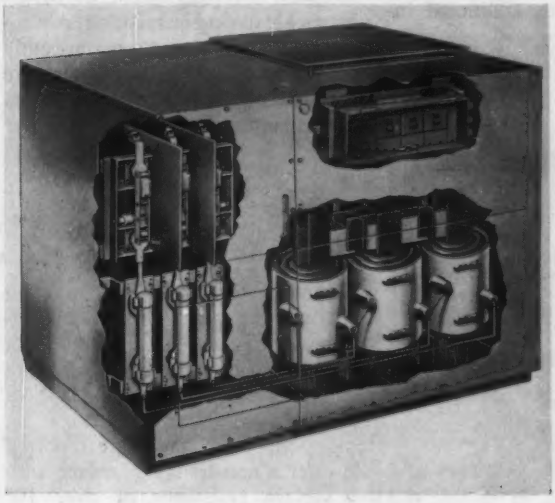


Designated type W, this 200-Mva, 3-phase, oil circuit recloser is for applications in substations or heavily loaded feeders where high fault currents may be expected. Said to be the largest self-contained interrupter available, it has continuous current capacities from 100 to 560 amp. Interrupting capacities run as high as 12,000 amp rms symmetrical for the larger 2.4 through 4.8-kv models, up to 10,000 amps for voltages through 8.32 kv, and up to 8,000 amp for voltages through 14.4 kv.

BIL of the type W is 110 kv. Normal minimum trip current is 200% of continuous current rating. Units rated 400 and 560 amp continuous are also available with minimum trip currents of 560 and 800 amp respectively, for those uses which require sensitivity to lower fault currents but not high capability for cold-load pick-up.

A fast clearing time of 2.5 cycles max. and four time delay characteristics are offered. Sequence and number of operations to lockout are said to be easily adjusted. Standard reclosing time is 120 cycles, adjustable to 25 cycles. A dual reclosing accessory provides a combination of 120 and 25-cycle operations. Accessories for remote control and load transfer and for sensing phase unbalance are also available.

Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.



Distribution Center

Distribution centers combining incoming lines, transformer, and outgoing feeder in one unit are offered in 75, 112.5, 150, and 225-kva models. Standard ratings range from 208 v to 15 kv. Reported to be 42% smaller than conventional equipment, units have 80-in. installed height; width varies from 56 to 106 in., depth from 37.5 to 42.5 in.

Air switches are manually operated from front panel. Doors and removable panels on front provide easy access to components for operation and routine maintenance. Any of several molded-case breakers, with ratings to 800 amp and interrupting capacities to 50,000 amp, may be used for secondary. Potheads and interlocking devices for use between low voltage breakers and high voltage switches are optional.

General Electric Co. Schenectady 5, N. Y.

Floodlights

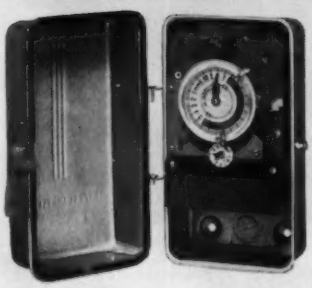
Mercury vapor floodlights, available in four types, are reported to have good longevity and high maintained lumen output. Types MVE-12, 14, and 16, for 250, 400, and 1,000-w lamps, are heavy-duty, dust-tight, weatherproof fixtures, with wide or narrow-beam reflectors. Types MVB-14 and 16, for 400 and 1,000-w lamps, are low cost, general-purpose lights. Type MVF, a 400-w model with rear relamping door, and type MVM, a 400 and 700-w model with front relamping door, come with wide, narrow, or medium-beam reflectors. Type MVP is for use where appearance is important. Bulletin 2696 provides more details.

Crouse-Hinds Co, Wolf and N. Seventh Sts, Syracuse, N. Y.

Remote Indicator

This drum-type precision indicator is equipped with numbered push-buttons on the front cover and can

BUY RELIABLE STREET-LIGHTING CONTROL AT MINIMUM COST



The General Electric heavy-duty time switch is a low-cost method of reliable street-lighting control. Dependability and long service life mean you save on maintenance costs, too. These features of the TSA-40 time switch make it an outstanding buy:

- Exclusive contact shearing action breaks welds and keeps contacts clean.
- Completely weatherproof case gives protection in all climates.
- Extended temperature range allows operation in temperatures from −50 to 150°F.
- More wiring space and removable cover simplify installation and maintenance.
- Off-the-shelf delivery means you can get the TSA-40 *when you need it.*

Contact your local G-E time switch distributor or send for free bulletin today!

GENERAL ELECTRIC

SECTION C584-6
GENERAL ELECTRIC CO.
SCHENECTADY 5, N. Y.

Please send me free bulletin GEA-6468A on the TSA-40 time switch.

NAME.....

POSITION.....

STREET.....

CITY.....STATE.....

be used to scan variables from as many as 48 remote points. The revolving scale has a calibrated length of over 26 in. Full-scale travel is said to take 4½ sec.

Offered in resistance thermometer and pyrometer models; available for measuring other variables. Bulletin P1245A has further details.

Bristol Co, Waterbury 20, Conn.

Fan-Cooled Motors

Re-rated fan-cooled motors are available in ratings from ½ hp to 40 hp in frame sizes from 182 to 405. Motors are said to be completely protected against moisture, dust, and corrosive atmospheres. The diecast aluminum rotor and its shaft are sprayed with rust inhibitor. Double layers of laminated Mylar and rag paper insulation are used in slots to minimize weak spots.

Wide, pre-lubricated, sealed ball bearings are set in double width races. Terminal box is diagonally split to simplify connections. Motors are available with standard NEMA C Face type flange mountings. Bulletin 500A provides additional information.

Robbins & Myers, Inc, Springfield, Ohio

Capacitor Brace

A front-of-pole brace which does not extend beyond the center line of the pole and is said to be rigid and compact is now standard equipment on all General Electric single-row, pole mounted capacitors utilizing 50-kvar units. Usable for poles from 7 to 15 in. in diameter, it is attached by driving ½ or ⅝-in. lag screws into the pole. Designed to meet certain utility and state safety requirements, it reportedly prevents equipment from turning in high winds.

General Electric Co, Schenectady 5, N. Y.

Aluminum Clamp

The No. 89650 Strateline aluminum clamp is designed for descending ACSR and all-aluminum conductors between 0.23 and 0.46 diam. Clamp is of non-copper bearing alloy and is said to have 8,000-lb ultimate strength. A 1-in. loop is intended for attachment to stringing tackle during installation. Aluminum keepers which are permanently attached to the ½-in. U-bolts are said to simplify hot-line installation and maintenance work.

Ohio Brass Co, Mansfield, Ohio

Plastic Tapes

Cementable Teflon tapes, with and without glass cloth reinforcement, are available in widths from 0.25 to 12 in. and thicknesses from 0.002 to 0.060 in. Either one or both surfaces may be treated for adhesion. These tapes are reported to offer a non-tracking surface with a surface resistance of over 10^6 megohms.

Glass-supported tape is said to have good abrasion resistance, high tensile strength, low cold flow, good dimensional stability, and mechanical properties. Manufacturer states that either tape can be bonded to any surface, with ordinary adhesives.

Continental-Diamond Fibre Corp, Newark, Del.

(*More New Equipment on page* 122)

Roebling electrical wire and cable are available with either copper or aluminum conductors.

STAYS "YOUNG," DUCTILE FOR YEARS!

Even after 5½ years' aging—as proved by actual test—age-hardening is negligible in Roebling's special Tellurium Lead Alloy Sheath.

That's just one of the advantages of this new sheath that gives longer, better service. Excellent resistance to creep and fatigue are others. Combine the exceptional *outer* qualities of this sheath with the careful *inner* construction of Roebling Paper Power Cable and a unique, serviceable cable is the result.

Wherever maximum service life is required, specify Roebling Paper Power Cable with Tellurium Lead Alloy Sheath. For complete information, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

DOUBLE PROTECTION WITH SUBOX PAINTS

Prevent Corrosion — Add Good Looks

Increasingly today, paints are required to do a double job: preserve plant and equipment and also the good feelings of neighbors and personnel.

Subox paints do both. Made with chemically-active lead-suboxide, they *actively combat* corrosion. Also, they are made in a range of scientifically chosen colors for modern decorative treatment, outside and in.

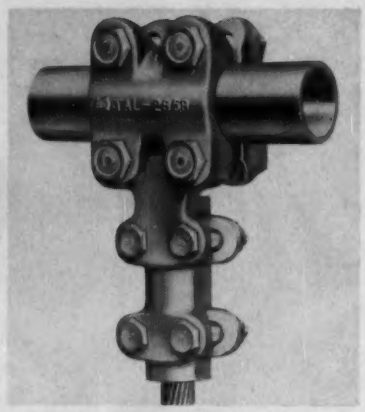
What's more, both corrosion protection and good looks endure far beyond the time of inert paints. Chemical action actually reinforces Subox paint with the passage of time —cracking, chipping or blistering seldom occur.

Only Subox paints are made with lead-suboxide. Write for color card and data booklet: "Subox Paints"

SUBOX PAINTS

Subox Inc.
*Trade Mark

Established 1924
3 Fairmount Plant
Hackensack, N. J.



T Connector

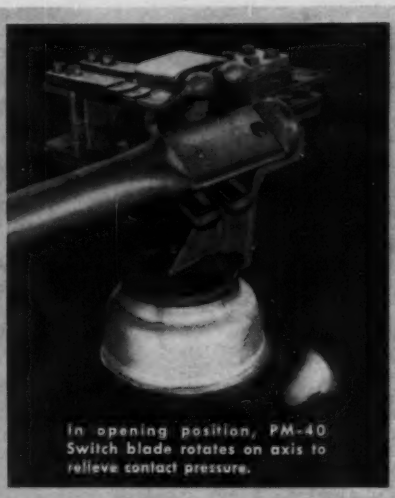
Type TAL aluminum tee connectors are available for specific run and tap sizes from No. 4 through 431 Mcm, all-aluminum or ACSR cable. The connector features recessed, self-retaining bolt heads for single wrench assembly and is said to have extra large contact areas. Body is heat-treated aluminum; bolts 24S-T4 aluminum.
Southern States Equipment Corp, Hampton, Ga.

Valve

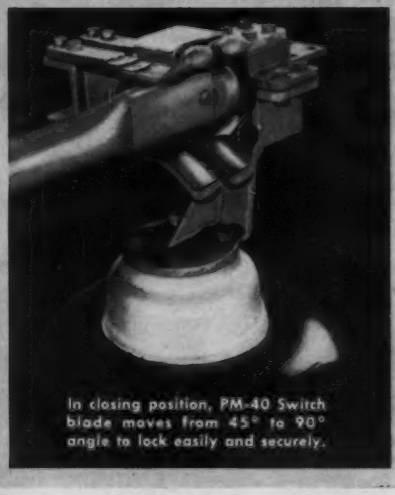
A valve designed for draining all the oil from a circuit breaker or transformer is available in 1-in., 1½-in., and 2-in. sizes. When installed, seat is ⅛-in. below bottom of the tank outlet. Disc material is nylon. No. 1941 illustrated, has sample device; No. 1942 does not.
Ohio Brass Co, Mansfield, Ohio

(More New Equipment on page 124)

PM-40 Double-Side-Break Switch features easy-rotating blade, high pressure silver-to-copper contacts, factory-sealed insulator bearing, and heavy duty construction. Voltage ratings, 115 to 330 KV; 600 to 1600 amperes.



In opening position, PM-40 Switch blade rotates on axis to relieve contact pressure.



In closing position, PM-40 Switch blade moves from 45° to 90° angle to lock easily and securely.

Here's easy, positive operation with Delta-Star's PM-40 Side-Break Switches

The ease of operating Delta-Star's PM-40 Double-Side-Break starts with its engineered simplicity. The rotating blade operates by over-toggle mechanism on a center rotating insulator. Balanced spring arrangement reduces operating effort when switch is opened or closed.

The simplified blade-actuating mechanism exerts enough power to easily break ice or corrosive formations—assuring ease of operation at all times.

PM-40 contacts are straight-line current path design with no offset to produce stress during fault currents. Tubular switch blade is one-piece, hard-drawn copper, with silver inlay contact points. The blade rotates on a factory-sealed, ball-bearing base.

Where you prefer or require side-break switches in voltage ratings of 115 to 330 KV, the Delta-Star PM-40 definitely deserves first choice consideration.

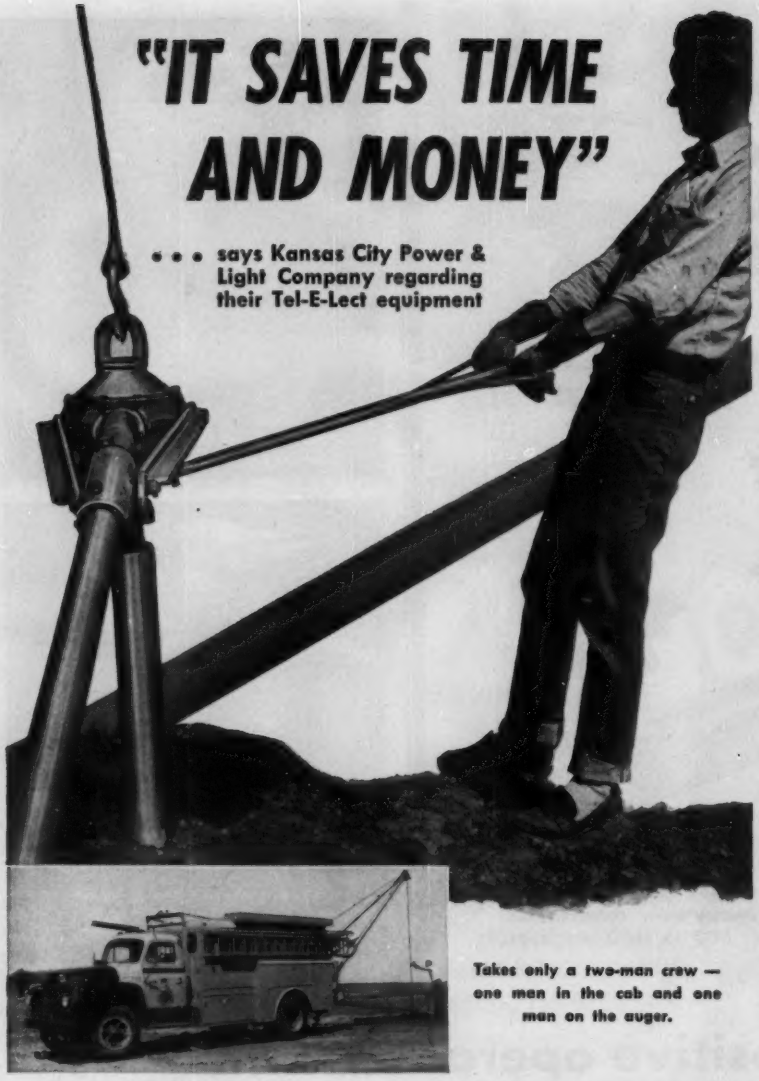
Call Delta-Star Electric Division,
H. K. Porter Company, Inc., Chicago 12, Illinois.
District offices in all principal cities.

HKP DELTA-STAR ELECTRIC DIVISION
H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Connors Steel, Delta-Star Electric, Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings.

"IT SAVES TIME AND MONEY"

• • • says Kansas City Power & Light Company regarding their Tel-E-Lect equipment



Takes only a two-man crew — one man in the cab and one man on the auger.

There's a lot of action when trucks mounted with Tel-E-Lect equipment go to work for the Kansas City Power & Light Co. of Kansas City, Mo. These pictures, taken at the site of the new Farmers Underwriters Assn. building in Overland Park, Kan., show the Power Company installing lines for 3 phase power. The holes being dug vary from 6½′ to 10′ deep. The company particularly likes the fact that the Tel-E-Lect digger unit is detachable from the truck, a big convenience feature.

What you see in operation here is Tel-E-Lect's Popular Model 350 digger that permits a two-man crew to dig a hole and set a pole in less than five minutes. Here you have low speed for digging, high speed for throwing off the dirt. For more information about the wide range of Tel-E-Lect equipment for utility trucks, write for a complete line bulletin.

There's a Tel-E-Lect service-dealer near you!

TEL-E-LECT

10003 Minnetonka Blvd.
Minneapolis 26, Minn.
PRODUCTS, INC.

MORE NEW PRODUCTS

Columbia Cable & Electric Corp, Brooklyn, N. Y., has Flex-Seal Type XL liquid-tight flexible electric **conduit** with spiral copper bonding strip between convolutions and a vinyl plastic sheath. It is available in sizes from ⅜ to 2 in.

General Electric Co, Schenectady 5, N. Y., has a 5-in. diam. shaded pole **motor** in ratings from 25 mph to 1½ hp which is reported to decrease input requirements 7 to 20% without affecting output. Said to be 40% quieter, it is intended for unit heaters, console heating and cooling units, and blowers where quiet is important.

Gulton Industries, Inc, 212 Durham Ave, Metuchen, N. J., has a Glennite Model UF-100 **straight-through flowmeter** which measures flow rate by modification of ultrasonic beam. Said to measure rates from 1,000 to 4,000 gal per min.

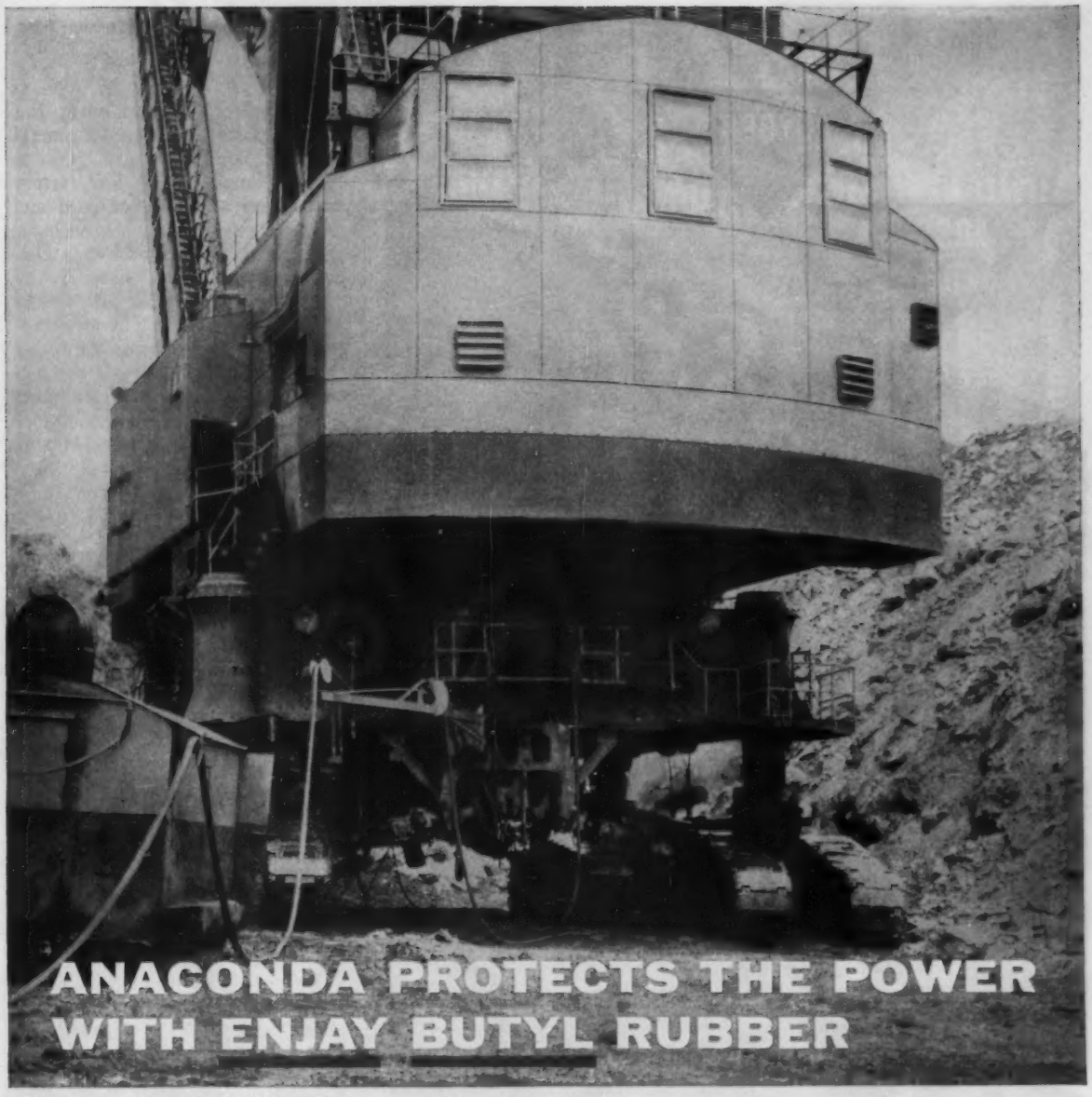
Weldmatic Div of Unitek Corp, Pasadena, Cal., offers a Weldmatic Model 1026 precision **portable power supply** that accommodates a variety of plug-in attachments, draws only 8 amp from a 115-v line, and weighs 29 lb.

Servo-Tek Products Co, Inc, 1086 Goffle Rd, Hawthorne, N. J., has a constant **reference voltage supply** to convert ac to stable dc as a reference voltage for adjustable speed motor drives and dc servo systems. With 115-v, 50 to 400-cps input, output is adjustable from 0 to 87 v.

General Switch Co, 45 Roebling St, Brooklyn 11, N. Y., has multiple **service disconnects** for residential and commercial use. Catalog No. 2041-18 and 2032-18 will take up to 4/0 AWG and are rated 200 amp. No. 1522-14, 1531-14, and 1540-14 accept 2/0 AWG, are rated 150 amp.

Lance Iron Works, Box 310R3, Chicago Heights, Ill., offers a one-man, portable radial **drill press** which clamps to the work piece, can be rotated through a 360-deg arc, and is suitable for construction, and maintenance work.

(More New Products on page 126)



ANACONDA PROTECTS THE POWER WITH ENJAY BUTYL RUBBER

Talk about impact resistance! The 5-year-old Anaconda cable supplying this giant shovel with power was buried under thousands of tons of rock when a whole wall of the open pit mine caved in . . . *yet the cable continued to supply power!* This is one of the many Anaconda products featuring Enjay Butyl for *outstanding* performance.

Enjay Butyl is *unmatched* in its resistance to impact and abrasion, moisture and weathering, ozone and corona . . . properties that make it the world's outstanding rubber value.

Low in cost and immediately available in a grade tailor-made for *your* electrical application, Enjay Butyl is *the* rubber to boost performance and cut costs. For further information, and for expert technical assistance, contact the Enjay Company.

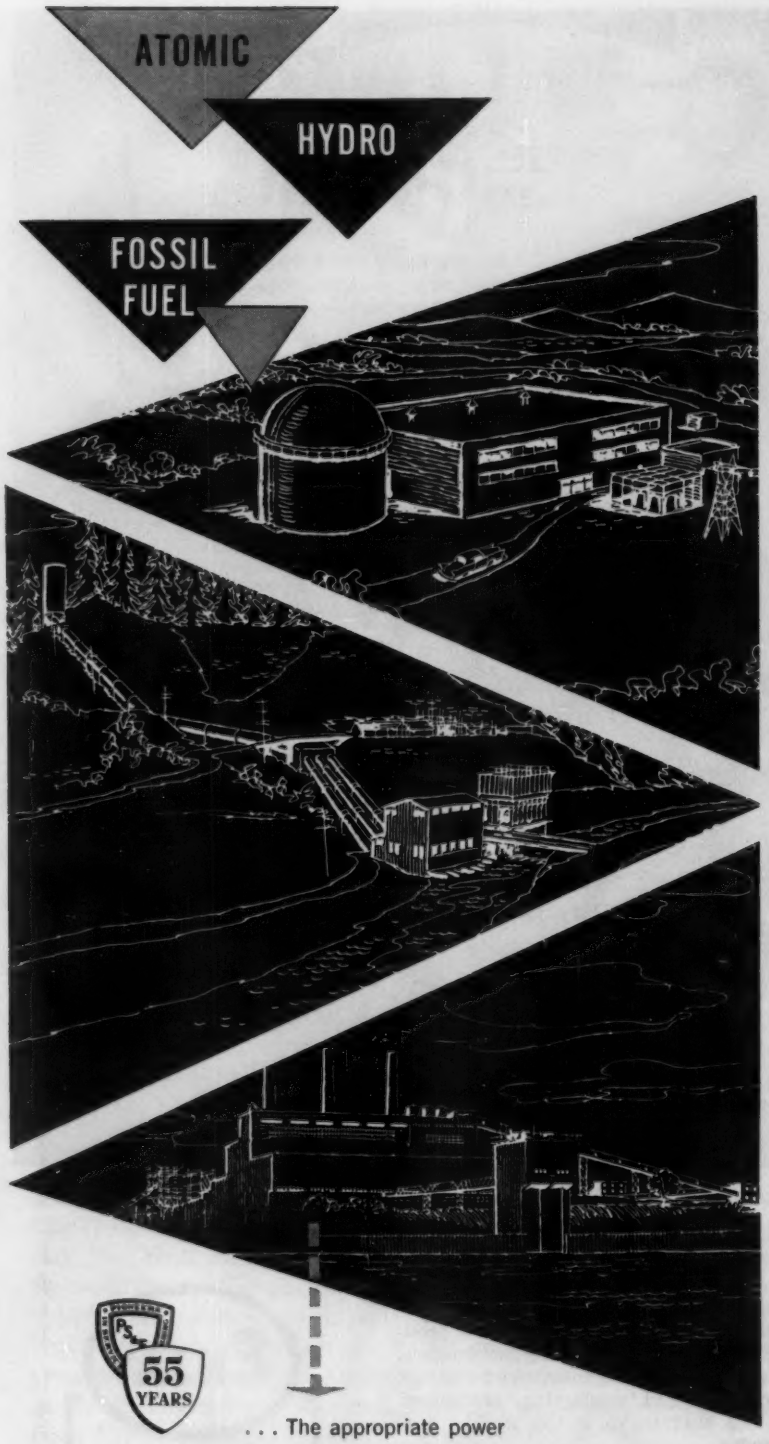
ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Akron • Boston • Chicago • Los Angeles • New Orleans • Tulsa

ENJAY BUTYL

Enjay Butyl is the world's greatest rubber value . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.



55 YEARS

. . . The appropriate power
for your expanding program

Send for our descriptive booklet, "Pioneering New Horizons" of these and other services.

Pioneer Service & Engineering Co.
231 South La Salle Street • Chicago, Illinois

More New Products

(Continued from page 124)

Steber Mfg Co, Broadview, Ill., has four porcelain enameled, general purpose **floodlights** for 100 to 300-w lamps. They are factory wired with weatherproof cord and are available in open or enclosed types to fit any 3¼ to 4-in. outlet.

Bristol Co, Waterbury 20, Conn., is marketing a Dynamaster **servomechanism** for use as an indicating pyrometer, potentiometer, replacement milliammeter or millivoltmeter, or as a self-balancing unit to operate analog-to-digital conversion mechanisms for readout.

General Electric Co, Electronics Park, Syracuse, N. Y., offers a Channel Guard **tone squelch system** which makes the receiver in a ultility two-way radio system respond only to the utilities' own transmission and cuts out other transmissions on the same channel.

DeVilbiss Co, Somerset, Pa., has an **atomizer** for spraying cleansing fluids on electrical contacts in instruments and similar equipment. Unit has a 5⅜-in. by $\frac{3}{32}$-in. diam tube for reaching through circuitry.

Howard Industries, Inc, 1760 State St, Racine, Wis. has miniaturized, fractional-hp, induction torque, and synchronous **motors** in ratings from 1/300 to 1/30 hp. Available in 115-v, single-phase, and 230-v 2-phase and 3-phase, 50/60 cps models.

International Harvester Co, 180 N. Michigan Ave, Chicago 1, Ill. has added two heavy duty, off-the-road all-wheel-drive **trucks:** Model R-190 (4x4) is rated 29,000 lb GVW and is available in four wheel bases from 142 to 193 in.; Model RF-190 (6x6) has choice of bogies to provide 38,000 or 43,000 GVW, with wheelbases from 157 to 211 in.

Gen-A-Matic Corp, 14714 Bessemer St, Van Nuys, Cal., offers the S1000 **lighting housing standard** for two-way flasher lights. Standard has side locks to prevent theft of flasher light and a 25-lb cast iron base for stability.

(More New Products on page 128)

DUAL VOLTAGE transformers

MEAN SAVINGS IN MONEY, TIME, LABOR

You save in stocking requirements . . . one unit can be stocked where it now takes two.

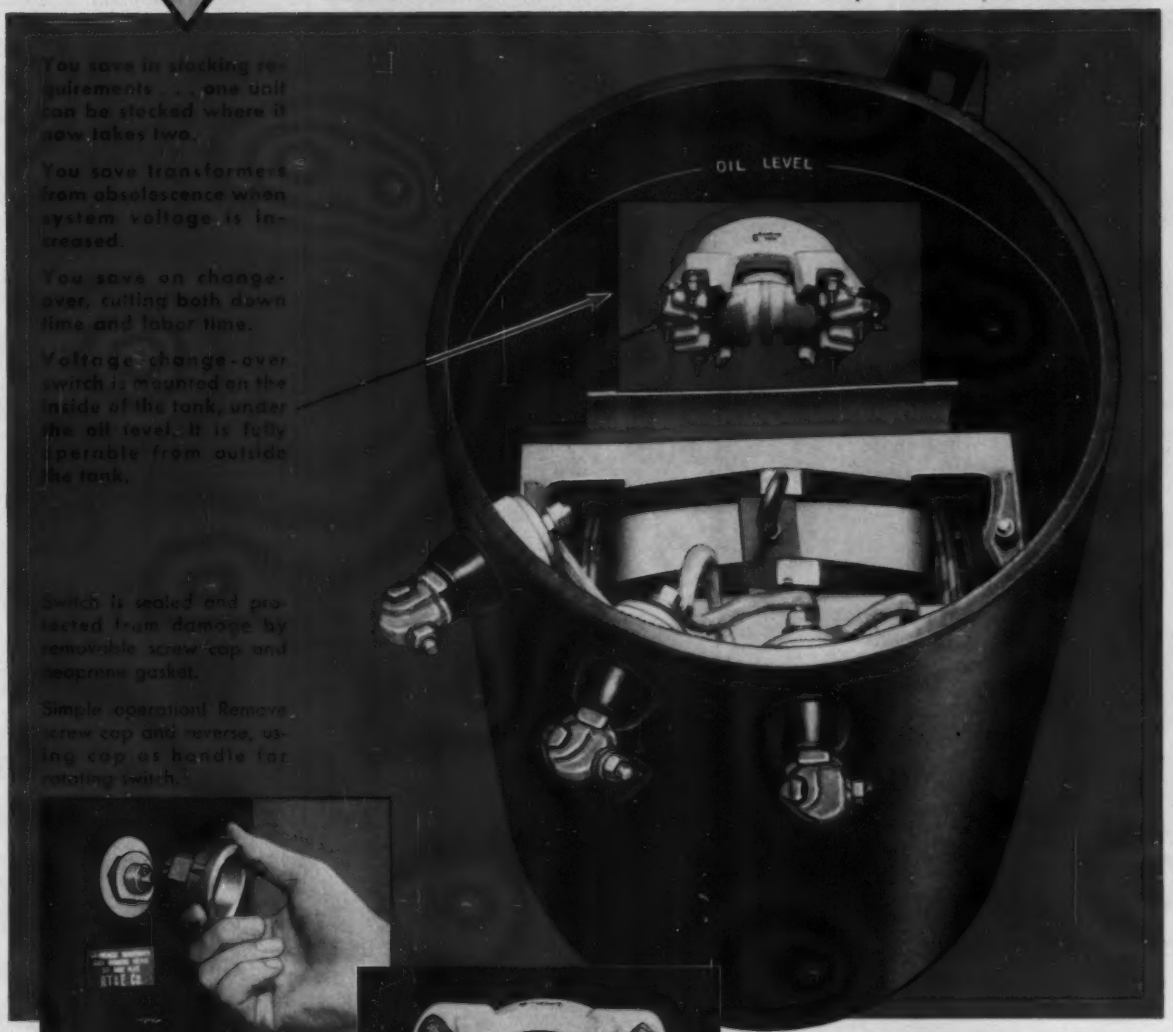
You save transformers from obsolescence when system voltage is increased.

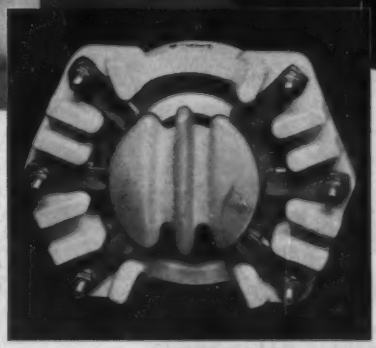
You save on change-over, cutting both down time and labor time.

Voltage change-over switch is mounted on the inside of the tank, under the oil level. It is fully operable from outside the tank.

Switch is sealed and protected from damage by removable screw cap and neoprene gasket.

Simple operation! Remove screw cap and reverse, using cap as handle for rotating switch.





Switch is rotary-bridging-to-position type, with both positions clearly identified by a stamped plate on the switch. Body constructed of wet process electrical porcelain with ample creepage. Fully impulse tested by NEMA standards.

For positive protection against puncture, flashover, or lightning failure the entire transformer is always insulated for the basic insulation level of the highest name plate voltage.

Available in	**2400 x 4800 volt** **2400 x 7200 volt** **4800 x 14,400 volt** **7200 x 14,400 volt**	**from 10 through 100 KVA.**

Like all RTE Transformers, dual voltage models are backed by a five year guarantee. They are available from conveniently located warehouses throughout the U.S.

HELPING PROVIDE POWER FOR AMERICA

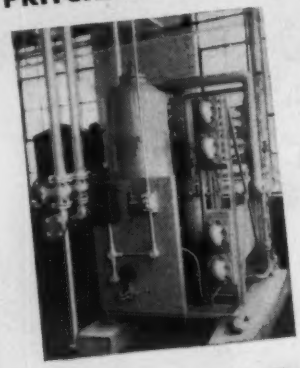
RT&E CORPORATION
WAUKESHA, WISCONSIN

Roger:
this is what we need
and here's why

SEND FOR BULLETIN

Pritchard bulletin No. 16.0.081 tells you the many ways HYDRYERS are used in the industry. Send for your complimentary copy today on your company letterhead!

EXCEPTIONAL DRYING OF GASES IS EVERYDAY ROUTINE FOR THE PRITCHARD HYDRYER!®



Tried and proved by companies like E. I. duPont de Nemours and Liquid Carbonic Corp., the Pritchard HYDRYER has exclusive features which make it ideal for drying synthesis gas, instrument air and other compressed gases:

- NO WASTE. 100% of all gas entering the HYDRYER is dried without loss
- FULL LINE PRESSURE REACTIVATION. Pressuring and depressuring of adsorbers between cycles is eliminated
- PURGING ELIMINATED. The Type A HYDRYER uses inlet main gas stream for reactivation
- LONGER ADSORBENT LIFE
- REACTIVATION GAS PRE-HEATED
- NO MOVING PARTS
- SIMPLIFIED OPERATION
- REDUCED EQUIPMENT AND LINE SIZES

. . . plus many other proved advantages.

Will you please send for this bulletin thanks Phil
their address is
J.F. PRITCHARD & COMPANY of CALIFORNIA
Dept. 595, 4625 Roanoke Parkway
Kansas City 12, Missouri

More New Products

(Continued from page 126)

Syntorque, Inc, 601 W. 26th St, New York 1, N. Y., has the following motors: **Hysterisis motors** in single and dual speed, single-phase and polyphase. **Induction motors** in torque, servo, and other type with controllable characteristics, single and dual speed, single-phase or polyphase. Special windings for frequencies to 1,600 cps and voltages to 440 are available.

BTU Engineering Co, 440 Somerville Ave, Somerville 43, Mass. markets a Transheat **electric furnace** for brazing, alloying and soldering transistors and other semiconductors.

Rowan Controller Co, Baltimore, Md., has a **synchronous switch** to be used in conjunction with an oscillograph or other measuring device to close a circuit at the point of maximum inrush current. Closing can be set at any point in the cycle. Contactor can close currents up to 5,000 amp.

Hobart Brothers Co, Troy, Ohio, has a **semi-automatic welding unit** for CO_2 and inert gas metal-arc welding. It starts and stops the arc, adjusts electrode feed speed, controls arc welder power and the flow of the shielding gas.

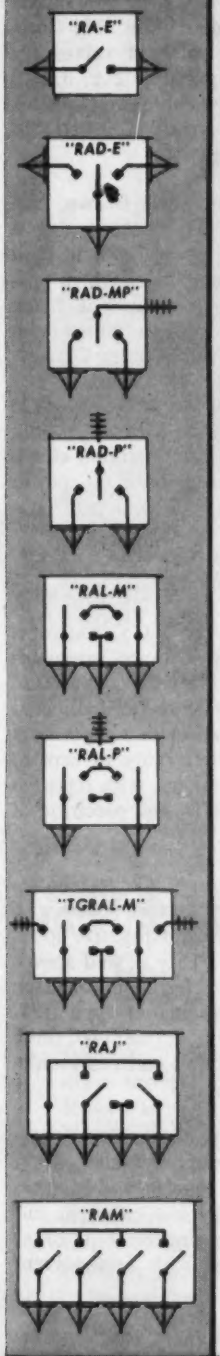
Allen B. Du Mont Laboratories, Inc, 750 Bloomfield Ave, Clifton, N. J., markets a Type 403 **oscilloscope** with a voltage range of 20 μv to 500 v in 17 steps and frequency response from dc to 300 kc. Said to read outputs from pickups and transducers without amplification.

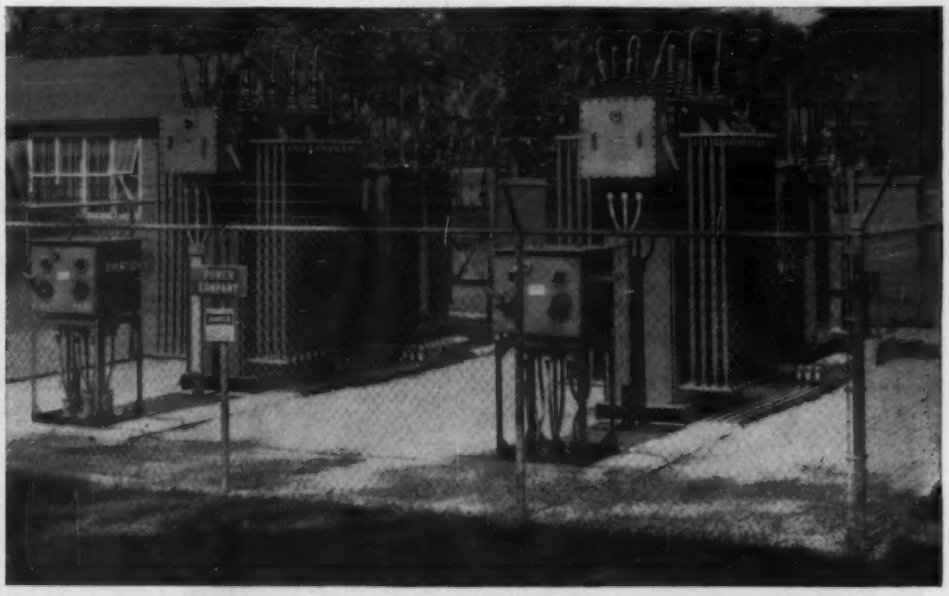
Magnatrol Valve Corp, Hawthorne, N. J., has a Type AR normally open **solenoid valve** for automatic control of water, gas, air, solvent or gas lines. Sizes ½ to 3 in. with pressure ratings to 300 psi.

General Electric Co, Plainville, Conn., has a type NHBX heavy duty column type **lighting panelboard** for 4-wire 480Y/208v solid neutral service. It accommodates 8 to 42 circuits with 200-amp max. lugs or 100-amp max. breakers.

(More New Products on page 130)

TYPE "RA" OIL SWITCHES ARE MADE IN VARIOUS FORMS TO MEET INDIVIDUAL REQUIREMENTS.

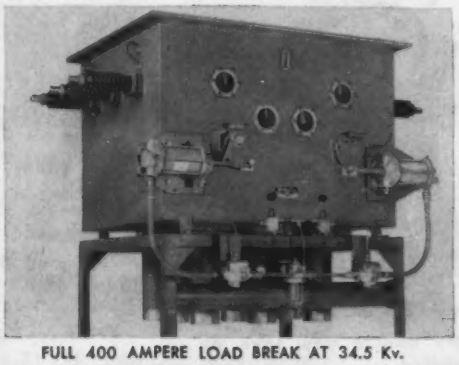




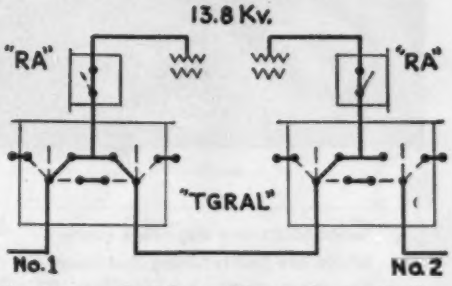
GET SAFE SYSTEM F-L-E-X-I-B-I-L-I-T-Y AT A LOWER COST IN YOUR DISTRIBUTION SUBSTATIONS

BY USING G & W "RA" LOAD BREAK OIL SWITCHES FOR PRIMARY SECTIONALIZING AT VOLTAGES UP TO 34,500.

Neat functional arrangements of standard equipment are being used regularly to affect appreciable savings in maintenance as well as first cost.



FULL 400 AMPERE LOAD BREAK AT 34.5 Kv.



Referring to the above illustration and diagram, feeders 1 and 2 are looped through and tapped in the two "TGRAL" load break oil switches. Each feeder can supply one transformer independently or both transformers together. Single throw "RA" oil switches mounted on the transformers provide load break isolation of the tap cables. Outlets on two sides of "TGRAL" oil switches permit testing and grounding the feeder cables. The position of the switching links can be seen through the windows in the switch tanks.

Manually controlled pneumatic mechanism is standard for 34.5 Kv oil switches and optional for remote manual operation of lower voltage "RA" oil switches.

Send for series "D" bulletins.

G & W ELECTRIC SPECIALTY COMPANY
3500 W. 127th ST., BLUE ISLAND, ILLINOIS D572

Representatives in many cities of U. S. A., N. & S. America — Canadian Mfr. – Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

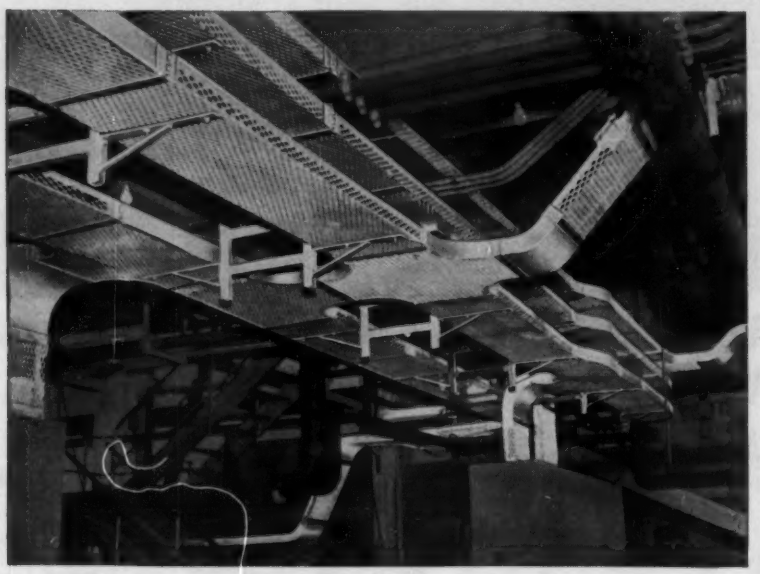
G&W

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices

POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS

YOU CAN SIMPLIFY CABLE INSTALLATIONS with COPE CABLE TROUGH

Humboldt Bay Steam Plant Pacific Gas and Electric Company
Engineers: Bechtel Corporation



Contractors and engineers everywhere are fast realizing that more time—more costs—are saved when Cope Cable Trough is specified.

- Cope Cable Trough goes up faster
- Cope Cable Trough simplifies designs
- Cope Cable Trough saves space

Specify Cope Cable Trough on your next job. You'll be amazed at how simple it is to install.

Tommy Cope says:
"Every minute you save on installation time increases your profit on the job."

C-616

Our engineers are ready to work with you. Write us today for full details on Cope Cable Supporting Systems.

T. J. COPE, INC.
COLLEGEVILLE 4, PENNSYLVANIA

Cope

More New Products

(*Continued from page* 128)

J. D. Gould Co, 4707 Massachusetts Ave, Indianapolis 18, Ind., has cast steel **solenoid valves** for liquids to 600 psi in 2, 2½, 3, and 4-in. sizes. Available in globe or angle pattern with screwed or flanged pipe ends.

Haller, Raymond & Brown, Inc, State College, Pa., is marketing a Model CPD-3 laboratory and field **infrared radiation source** which produces accurately controlled black body radiation at temperatures from ambient plus 10 to 500 deg C.

Bristol Motor Div of Vocaline Co of America, Inc, Old Saybrook, Conn., has solenoid operated **clutch motors** with speeds from 60 rpm to one revolution per month and a maximum output torque of 20 oz-in. for chart drives, high speed timers, and reset type timers.

Cahn Instrument Co, Downey, Cal., has Electrobalance **microbalance** which can be carried around at will and is said to be unaffected by shock, vibration or temperature change. It covers range of zero to 50 mg in four ranges, with reported accuracy of 0.05% and precision of 0.02%.

Cramer Controls Corp, Centerbrook, Conn., offers **cam timers** with contacts for 30-amp resistive loads (and ⅓ hp) at 115 v ac and speeds from 1 rpm to one revolution each eight days. Designated type 571, they are available in one, two, three or four-pole models and can handle up to 8 load circuits.

Permacel Tape Corp, New Brunswick, N. J., offers a black cotton cloth electrical **tape** in widths from 0.25 to 4 in. for use either as uncured, pressure sensitive tape or as heat cured tape with firm solvent resistive adhesive.

Fielden Instrument Div, Robertshaw-Fulton Controls Co, 2920 N. 4th St, Philadelphia 33, Pa., has Pneutronic pneumatic-electronic **level controls** for water, acids, alkalais, oils, and aqueous solutions in Class I Group C and D and Class II Group E, F, and G hazardous locations.

NEW ANACONDA
15 KV UNGROUNDED-NEUTRAL CABLE

Construction: 3/C 500 MCM copper; strand shielding; insulation of 18/64" natural ALATHON polyethylene; semi-conducting resilient tape; tinned-copper shielding. Conductors cabled with suitable fillers; copper binder; cable tape; 7/64" inner jacket of high-molecular-weight, black ALATHON polyethylene; aluminum interlocked armor; 9/64" outer jacket of same ALATHON as inner jacket. *Anaconda Wire & Cable Co., New York, N. Y.*

Cables insulated and jacketed with Du Pont ALATHON® have low dielectric loss...carry greater loads

Because of its unique properties, Du Pont ALATHON offers remarkable advantages when used as an insulating and jacketing material. ALATHON polyethylene resin has an extremely low power factor and dielectric constant, therefore, low dielectric loss. Negligible heat due to dielectric loss means that, compared with other insulations, a cable insulated with ALATHON pays dividends in load-carrying capacities – as much as $100 per year per thousand feet.

Insulated and jacketed with ALATHON, the cable construction, shown above, has a smaller diameter than other non-leaded cables – less weight than leaded cables. The minimum weight results in lower shipping and installation costs, plus easier handling. This construction also provides protection against moisture, oxidation, chemical exposure and mechanical damage.

ALATHON permits a higher current rating than other materials with the same temperature limitations because its thermal conductivity is greater – about twice that of rubber.

Consult with your supplier. He will be happy to explain the advantages of wire and cable constructions utilizing insulation and jacketing of Du Pont ALATHON polyethylene resin for your specific requirements; or write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 484, Wilmington 98, Delaware.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

There is a difference in polyethylenes—specify an **ALATHON**
polyethylene resin

PREMAX

METAL MARKERS

REMAIN PERMANENTLY LEGIBLE WITHOUT MAINTENANCE

- Stamped and Embossed Brass and Aluminum.
- Cannot rust or fade.
- Far superior to old fashioned paint and stencil markings.
- REA Approved.

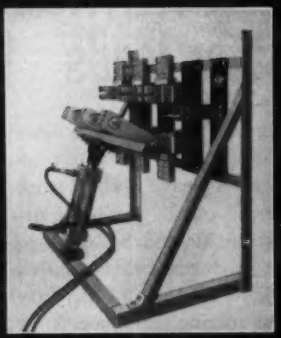
Ask your jobber, or write

PREMAX PRODUCTS

Div. Chisholm-Ryder Co., Inc.

5747 Highland Ave., Niagara Falls, N. Y.

New AIR OPERATED INDOOR DISCONNECT SWITCH by BARKELEW



200 TO 12000 AMPS

250 TO 15000 VOLTS

A new air-operated indoor disconnect that can be conveniently and safely operated by remote control. Available in single and double throw.

Write Dept. B for more information.

BARKELEW ELECTRIC MFG. CO. MIDDLETOWN, OHIO

CATALOGS—BULLETINS

• **PORTABLE HOISTS:** A 12-page booklet, No. 3-9B, covers the Joy single-drum, multi-purpose hoists made by Joy Mfg Co, Oliver Bldg, Pittsburgh 22, Pa.

• **FLOODLIGHTING:** A 48-page catalog covers the line of cast aluminum floodlighting fixtures manufactured by Stonco Electric Products Co, 333 Monroe Ave, Kenilworth, N. J.

• **PAINTS:** "Corrosion Control" is the name of a 4-page brochure containing the painting recommendations for application of paint products to electric light and power equipment. Write James B. Sipe & Co, Industrial Division, Pittsburgh 16, Pa.

• **HIGH-CEILING DOWNLIGHTS:** Folio X-60 describes incandescent 500-w mogul and bi-post lamp units for ceilings heights over 20 ft. It is available from Gruber Brothers, Inc, 125 S. First St, Brooklyn 11, N. Y.

• **MAGNETIC LAMINATIONS:** The manufacturer's line of "Performance Guaranteed" magnetic laminations is covered in Catalog ML-201 issued by Magnetics, Inc, Butler, Pa.

• **INSULATING FILMS & TAPES:** PTF electrical insulating films and tapes are the subjects of a 4-page flyer published by Minnesota Mining & Mfg Co, St. Paul 6, Minn.

• **OIL TESTING KIT:** The manufacturer's Simplex Oil Testing Kit is described in Newsletter Vol 4 (Special) issued by Gardner Laboratory. The kit is for determination of the amount of harmful contaminants in used engine oils. Write Gardner Laboratory, Inc, P. O. Box 5728, Bethesda 14, Md.

• **INDUSTRIAL VACUUM CLEANER:** A detailed, illustrated description of the Hoffo-Vac "35" High Vacuum Portable Cleaner is contained in Form M-135, available from U. S. Hoffman Machinery Corp, 105 Fourth Ave, New York 3, N. Y.

• **CENTRIFUGAL OIL PURIFICATION:** Bulletin OP No. 109 describes the various model oil purifiers and their particular applications, made by De Laval Separator Co, Poughkeepsie, N. Y.

• **CARBON CURRENT COLLECTORS:** Morganite carbon current collectors are the subject of a 4-page brochure issued by Morganite, Inc, 33-02 48th Ave, Long Island City 1, N. Y.

• **PRODUCT DIRECTORY:** A brochure describes the 35,000 products made by Corning Glass Works. This Product Directory is available upon request from the company at Corning, N. Y.

• **HIGH TEMPERATURE ALLOYS:** The engineering properties and fabrication characteristics of 10 high-strength alloys for elevated temperature service are covered in a 20-page booklet issued by Carpenter Steel Co, 378 W. Bern Street, Reading, Pa.

• **PRODUCT CATALOGS:** The below listed publications are products catalogs issued by Airtemp Division, Chrysler Corp, 1600 Webster Street, Dayton 1, Ohio:

"Packaged" Liquid Chiller Catalog, Form AC-233, illustrates and contains specification data on Airtemp "SW Series" of sealed, water-cooled "packaged" liquid chillers—3 to 30 tons.

Radial Compressor Catalog, Form AC-249, contains information on Airtemp's 10 to 125-hp line of radial compressors for commercial and industrial air conditioning and refrigeration.

• **MAGNET WIRE:** A 4-page magnet wire specifications sheet is available from Wire & Cable Division of Electric Auto-Lite Co, Port Huron, Mich.

• **CONVERSION CHART:** A conversion chart for wall hanging is available from Precision Equipment Co, 3714 N. Milwaukee Ave, Chicago 41, Ill. Chart gives conversion factors for all common weights, mesaures, distances, etc. Free.

• **ROLLER GEAR DRIVES:** Bulletin 107A describes the line of "E" Series Fergurson roller gear drives for precision indexing of O.E.M. machines and instruments with low torque requirements and a need for indexing rates to up to 2,000 rpm. Available from Fergurson Machine Corp of Indiana, Roller Gear Division, P. O. Box 5841, St. Louis 21, Mo.

• **LIGHTING EQUIPMENT:** Benjamin Catalog No. 28 is the company's general catalog covering its line of commercial and industrial lighting equipment. All product lines are included in one 300-page volume. Information is arranged in sections that are index-tabbed. Write Benjamin Electric Mfg Co, Des Plaines, Ill.

• **COOLING TOWER & HEAT EXCHANGER FANS:** Bulletin A-111B covers the line of adjustable-pitch cooling tower and heat exchanger fans manufactured by Hartzell Propeller Fan Co, Piqua, Ohio.

• **SECONDARY UNIT SUBSTATIONS:** I-T-E secondary unit substations, both indoor and outdoor, are covered in Bulletin 9004-A. All standard kva ratings, primary 2.4 through 14.4 ka, and secondary 120/208 v through 600 v are covered. Transformers are oil or Askarel-immersed, ventilated or sealed dry types. Write I-T-E Circuit Breaker Co, Switchgear Division, 19th & Hamilton Streets, Philadelphia 30, Pa.

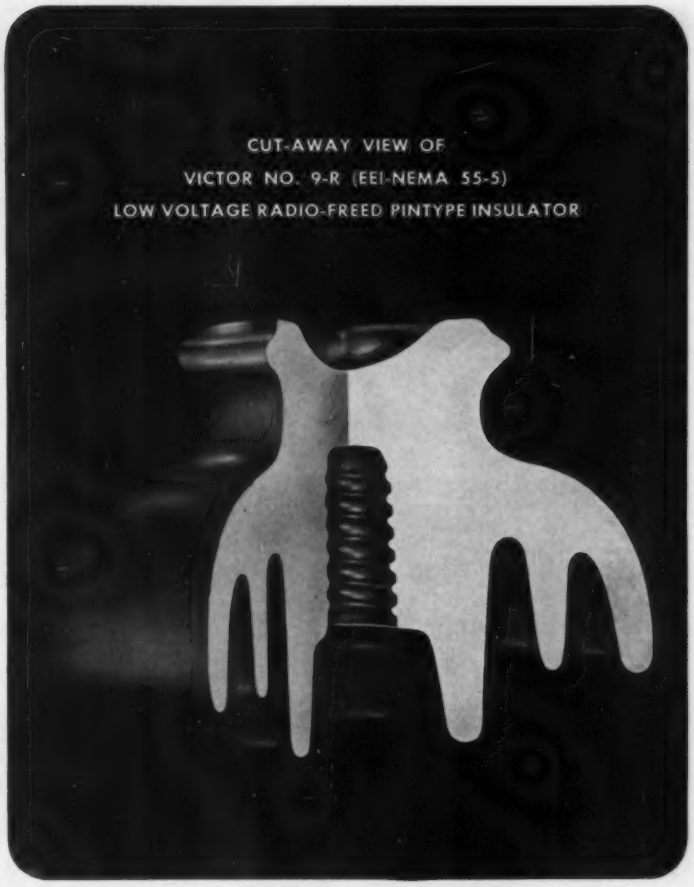
• **AUTOMATION SYSTEM:** A bulletin describing the CA automation system for power inputs of electrostatic precipitators is now available. Address Research-Cottell, Inc, Bound Brook, N. J.

• **MAGNET WIRES:** A performance chart of its various magnet wires is available through the Wire & Cable Division of Electric Auto-Lite Co, Port Huron, Mich.

• **FLOWMETER:** A 4-page booklet, Product Data Sheet 463-170, describes the "Centrimax" Flowmeter made by Leeds & Northrup Co, 4934 Stenton Avenue, Philadelphia 44, Pa.

• **BRIDGE CRANES:** Bulletin DH-459A contains data on construction details, weights, dimensions and general information on the B-47 Hand Traveling Crane in capacities from 3 to 10 tons made by American Chain & Cable Co, Inc, 929 Connecticut Avenue, Bridgeport 2, Conn.

CUT-AWAY VIEW OF
VICTOR NO. 9-R (EEI-NEMA 55-5)
LOW VOLTAGE RADIO-FREED PINTYPE INSULATOR



NO INSULATOR IS MADE WITH GREATER CARE THAN A *VICTOR* PINTYPE!

VICTOR Pintypes are designed and manufactured with the same *Purified* Porcelain as high voltage units. VICTOR Pintypes are design-tested with steep front impulse wave in addition to the normal 1.5 x 40 standard impulse wave.

The conductive glaze on VICTOR radio-freed units is readily *distinguishable* and *permanent*. Accurate, die-formed porcelain threads assure ease of installation. Machine glazing guarantees uniform glaze application, giving optimum dielectric and mechanical strength. *Every* VICTOR Pintype receives the same careful routine electrical testing as VICTOR high voltage insulators. That's why—when you buy VICTOR, you just can't buy better pintypes.

New . . .

VICTOR CATALOG

Now ready for distribution is Victor's newest and most extensive catalog. One of the most complete in the field, it includes illustrations and data on many items being produced at VICTOR and not previously shown, up-to-date EEI-NEMA Standards, and an outline of VICTOR'S new plant, research, testing and manufacturing facilities. It's FREE! Write for your copy.

Nothing beats Porcelain

FOR ELECTRICAL INSULATORS!

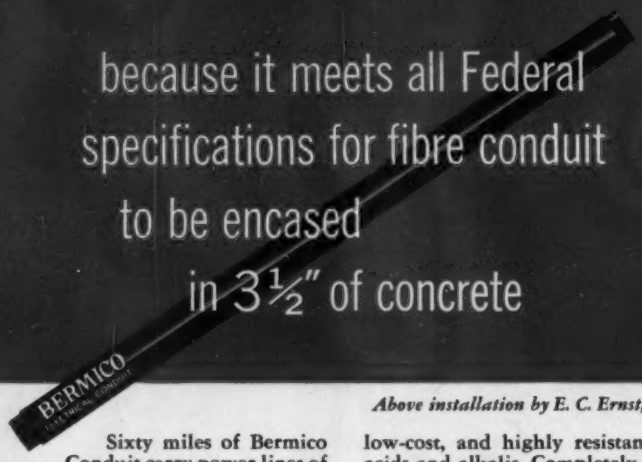
VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., Inc.

VICTOR, N.Y.

BERMICO® electrical conduit used at Norfolk Naval Air Station...

because it meets all Federal specifications for fibre conduit to be encased in 3½" of concrete



Above installation by E. C. Ernst, Inc.

Sixty miles of Bermico Conduit carry power lines of up to 34,000 volts as well as signal lines for communications and supervisory systems at the U.S. Naval Air Station, Norfolk, Va.

Precision engineered Bermico Conduit is made to exacting specifications from cellulose impregnated with pitch. It is strong, light, low-cost, and highly resistant to acids and alkalis. Completely uniform, it installs quickly and easily.

Bermico Conduit is specified by leading electrical contractors and by public utilities from coast to coast. To speed your cable installations . . . specify Bermico Conduit. Immediate shipment of all sizes and fittings guaranteed.

Distributed by WESTINGHOUSE Electrical Supply Company
Offices in principal cities

BROWN COMPANY
Berlin, New Hampshire
General Sales Offices: 150 Causeway Street, Boston 14, Mass.

BOOKS

Books Received Since February 5

Die Transformatorn. By Milan Vidmar. Published by Birkhauser Verlag, Elisabethenstrasse 15, Basel, Switzerland, 626 pages, illustrated.

Electrical Systems Design. By Joseph F. McPartland and the Editor of Electrical Construction & Maintenance. Published by McGraw-Hill Book Co, Inc., 330 W. 42nd St, New York 36, N. Y. 140 pages, illustrated. Price $6.00.

An Introduction to Junction Transistor Theory. By R. D. Middlebrook. Published by John Wiley & Sons, Inc. 440 Fourth Ave, New York 16, N. Y. 296 pages, illustrated. Price $8.50.

Alternating Current Bridge Methods. By B. Hague. Published by Pitman Publishing Corp. 2 W. 45th Street, New York 36, N. Y. 650 pages, illustrated. Price $12.50.

Ball-to-Plate Gap Flashover

Die negative Koronaentladung in der Spitze-Platte- Funkenstrecke. By Dr-Ing. Rudolf W. Guck. Published by Verlag C. F. Muller, Karlsruhe, West Germany. 106 pages, illustrated. Price, paper bound, DM 11.

This pamphlet, one in the series published in German by the Institute for Electrical Installations and High-Tension Technology, examines discharge characteristics of a ball-to-plate gap. Tests up to 30 kv dc reveal an initial pre-sparking current which grows exponentially into a steady discharge as voltage is raised.

Researchers and engineers working with the design and protection of high-voltage apparatus would find useful data in these investigations. They might also aid the interpretation of dc testing.

Electricity in Industry

Factory Electrification. By F. T. Bartho and C. H. Pike. Published by Philosophical Library, Inc., 15 E. 40th Street, New York 16, N. Y. 398 pages, illustrated. Price $12.00.

This informative book is intended both as a guide for industrial electrical engineers and as a general reference work on contemporary British industrial practice. Selection, operation and maintenance of industrial distribution equipment and motors are treated in terms of the principles involved and the range and limitations of equipment available.

Mathematics is limited to simple algebra. Chapters on switchgear, transformers, cabling, motors, and controls are supplemented by a thorough and extensive discussion of motor applications. With allowance for differences in British and American methods, this material should be a valuable asset to industrial electrical engineers. It might also be useful as a practical text for training utility industrial power sales personnel.

The Case of WASTED HORSEPOWER

or

"Over-motoring" is outmoded by Dow Corning Silicones

SCENE: Pump room, Anyplant, U. S. A.

CHARACTERS: TINY H.—a 5 hp Class H motor insulated with Dow Corning Silicones. BLUSTER A. — a 7½ hp Class A motor.

TINY H: You're goofing-off again! Why don't you try moving a bigger load now and then?

BLUSTER A: Nuts to you, Tiny. I'm working hard enough keeping this little pump going.

TINY H: But you're strong enough to drive a bigger pump . . . or are you?

BLUSTER A: That's enough. I should worry—the engineers who put me here figured I might have to carry a 6 hp load—er—once in a while, at least.

TINY H: Sooo what! I'm rated to match our average load. My silicone insulated innards give me extra muscles to carry any overloads. Why—I could pump a 7 hp load and still be here when you're dead and gone.

BLUSTER A: Shut up, Tiny! Somebody might hear you.

TINY H: Okay, fat stuff, but you can't hide the facts forever. Mark my nameplate—one of these days the boss will figure out how much money you're wasting and you'll have had it.

You can match the load . . .
let Silicones carry the overload

Lazy motors cost money! Why continue to pay a fat premium for motors that make kid's play of their average work load? Today, you can save money by using silicone insulated motors rated to match your average load. Their built-in service factor of 25 to 50% will handle most intermittent overloads or loads that can't be matched in standard frame sizes.

Remember, over-motoring is outmoded

Get sources for silicone insulated equipment—mail coupon today

Dow Corning Corporation, Dept. 4416, Midland, Mich.

Please send me sources of supply for new Silicone (Class H) ☐ Motors ☐ Transformers

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

DOW CORNING SILICONES

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA • BOSTON • CHICAGO • CLEVELAND • DALLAS
DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D. C.
(Silver Spring, Md.)

CANADA: Dow Corning Silicones Ltd., Toronto
GREAT BRITAIN: Midland Silicones Ltd., London
FRANCE: St. Gobain, Paris

take a long look at...

meter economics

You can effect prompt and progressive savings by standardizing now on the *meter of the future* — the Westinghouse Lifetime 30-ampere, single-phase meter. With full 200-ampere extended range, it will measure all present and future single-phase residential loads that can be provided on single-phase service, and *it is guaranteed for 30 years.*

This year, 57% of the single-phase watthour meters purchased and installed by the Electric Utility Industry represented change-outs due to obsolescence in the face of growing load. The other 43% went on new homes with high initial loads and rapid growth potential.

This new 30-ampere Westinghouse meter certainly is the meter for this year — and '66 — and '76 — and even '86. First, consider the value of simplified inventory — if you standardized! Then take notice that there is *not one cent more investment,* initially, *than for modern 15-ampere ratings.* There's no mathematical trick. Call your Westinghouse sales office, or your Westinghouse meter specialist . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-40493

YOU CAN BE SURE...IF IT'S

Westinghouse

MEN RESPONSIBLE FOR

POWER DISTRIBUTION KNOW...

IF IT'S PARANITE IT'S RIGHT!®

FROM AERIAL TO UNDERGROUND CABLE . . .

Paranite has a cable specifically engineered to meet your most rigid requirements! Super-Pararite® butyl rubber insulations have been developed to withstand special conditions in *your* area. Copper or aluminum bare or weatherproof cables — ACSR or line wire (formerly products of Midland Wire Corporation) are available.

PARANITE WIRE AND CABLE

DIVISION ESSEX WIRE CORPORATION

FORT WAYNE 6, INDIANA

MANUFACTURING PLANTS: ***Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio**

Warehouses* and Sales Offices

*Chicago, Illinois	Hartford, Connecticut	*Newark, New Jersey	Rochester, New York
Cleveland, Ohio	Indianapolis, Indiana	Omaha, Nebraska	*Saint Louis, Missouri
Dallas, Texas	*Kansas City, Missouri	*Portland, Oregon	*San Francisco, California
*Detroit, Michigan	*Los Angeles, California	Upper Darby (Philadelphia), Pa.	Springfield, Illinois

ELECTRICAL BUSINESS OUTLOOK

Electrical World

APRIL 8, 1957

Have you measured the local impact of the highway program? For an over-all U. S. index the Council for Economic & Industry Research, Inc, a private research organization, has computed some interesting findings. For example:

Federal and state road building will generate $72 million in sales a year for electric utilities in the next 13 years, based on 1947 prices and production techniques. This represents both requirements on the program and all indirect requirements from each industry.

The gage for this new business tells only part of the story. CEIR's figures do not include load builders such as motels and filling stations. Nor does it include capital replacement or construction in other industries.

Road building is expected to provide some 880,000 jobs across the base of the 190 U. S. industries. CEIR results don't include household demands of persons employed directly or indirectly on the $100-billion program.

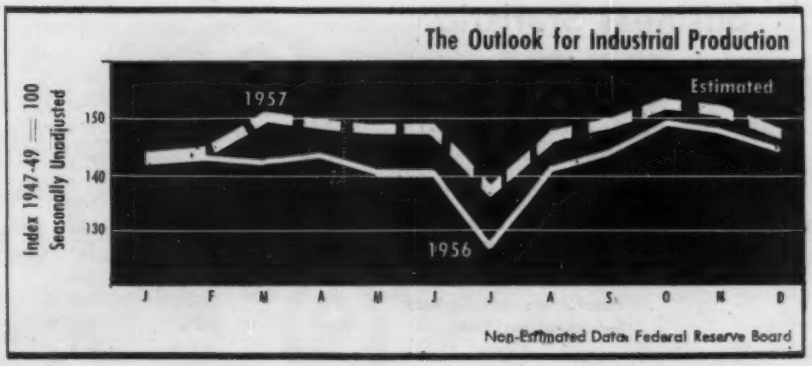
Manufacturers will sell some $126 million of electrical equipment yearly for the road network. Their best sellers: Lighting fixtures, $43 million; power transformer equipment, $22 million; motors and generators, $17 million; insulating wire materials, $8.4 million; wiring, $7.1 million. These are also based on near-obsolete highway building techniques and generally lower '47 prices.

• • •

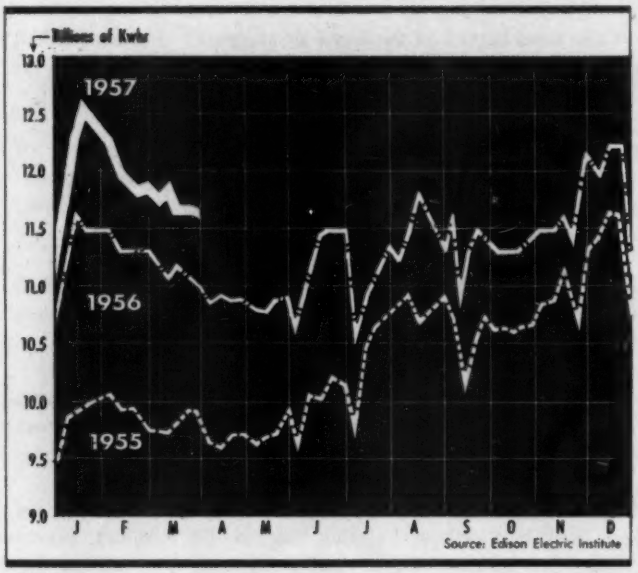
Consumers will apply brakes a bit on installment credit in next 10 years. Federal Reserve Board announced this conclusion in a recent report on its monumental study of consumer credit. Important to utilities because of credit effect on "big ticket" durable sales are these factors:

Installment credit's biggest impact has been in auto sales. But easy access to big sums of time-pay money has also encouraged consumers to substitute a TV set or a washing machine for the movies or laundry services.

Dollar volume of credit extensions will continue to increase, but somewhat more slowly. Extensions have averaged a 10% yearly increase for the past three decades. They'll probably slow down to a 5% to 6% gain for the next 10 years. This would add roughly $20 billion to durable sales in the period. Reason for the slowdown: Higher incomes combined with a tapering off in the rate of family formations until 1960 means there will be no great change in number of people who want to pay on time.



STATISTICS



OUTPUT
Week ended March 30, 11,694,000,000 Kwhr Up 6.4%

Per Cent Change From Previous Year

	Mar. 16	Mar. 23	Mar. 30
Total U. S.	+4.0	+ 5.3	+ 6.4
New Eng.	+1.1	+ 4.0	+ 3.9
Mid. Atlan.	+0.0	+ 2.1	+ 2.1
Cent. Ind.	+4.0	+ 4.9	+ 6.8
West Cent.	+7.0	+ 8.3	+ 8.7
Southeast	+5.2	+ 4.9	+ 7.8
South Cent.	+9.4	+12.5	+10.1
Rocky Mount.	+5.9	+ 8.0	+ 8.1
Pacific			
NW	+0.5	+ 4.7	+ 3.6
SW	+5.4	+ 5.5	+ 7.7

Seasonally Adjusted Index 229.7
Week Ago 225.8
Year Ago 214.5

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 6.9%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Jan.	121.20	120.43	114.55	5.8
Peak—Class 1 Systems. million kw	Jan.	104.0	102.8	95.8	8.6
Estimated Dec. '57 Peak	Dec.	114.5	114.8	112.6	1.7
Production—billion kwhr	Jan.	55.50	52.88	51.12	8.6
Hydro		10.19	10.00	9.36	8.9
Fuel		45.31	42.88	41.76	8.5
Sales—billion kwhr	Jan.	49.15	47.46	46.32	6.1
Residential		14.44	13.22	13.45	7.4
Commercial		7.54	7.34	7.00	7.7
Industrial		24.68	24.44	23.60	4.6
Other		2.49	2.47	2.27	9.7
Fuel Consumption	Jan.				
Coal—million tons		15.98	14.73	15.22	4.9
Oil—million barrels		9.90	8.22	8.22	20.4
Gas—million cu ft		74.77	82.17	68.27	9.5
Net Income Class A & B Co's—million	Dec.	132.82	102.54	124.95	6.3
Residential Customers—millions	12 mos.	45.71	45.62	44.41	2.9
Revenue per kwhr	ended	2.60¢	2.60¢	2.64¢	−1.5
Avg kwhr per customer	Dec. 31	2,969	2,942	2,751	7.9
Avg annual bill		$77.19	$76.86	$72.63	6.3

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Feb.	146	146	143	2.1
ENR Construction Cost	Mar.	148.6	148.9	142.6	4.2
BLS Cost-of-living	Feb.	118.7	118.2	114.6	3.6
New Orders for Machinery (1950 = 100)	Feb.	158	152	161	−1.9
NEMA Sales					
Insulation materials	Jan.	154	139	159	−3.1
Electric appliances		96	84	105	−8.6
Wholesale prices	Jan.				
Motors and generators		140.2	140.6	126.5	10.8
Transformers and regulators		146.6	146.6	131.2	11.7
Switchgear and fuses		164.4	163.9	147.5	11.5
GNP—annual rate—$ billion	4th Qtr.	423.8	413.8	397.3	6.7

MANAGEMENT BULLETIN

FINANCE

There were only two electric utility offerings last week. This was the aftermath of the $250-million debenture issue of American Telephone & Telegraph Co which went very well. First was the 300,000 common share issue of California Electric Power Co won by Merrill Lynch group with a bid of $13.436 a share. Reoffering was at $13.875 a share. The second was the $12-million first mtg 4⅜% bond (Aa) due 1987 of Western Massachusetts Electric Co won by Eastman Dillon group with a bid of 100.614%. Reoffering was at 101.426% to yield 4.29%. Issue was reported getting "fair reception."

New Orleans Public Service bond issue is "going very well." Halsey, Stuart & Co group makes this announcement as it begins to offer $6 million first mtg 4½% bonds (A) due 1987 at 100.823% to yield 4.45%. Group won the issue with a bid of 100.133%.

Investors will be putting more than $4 billion a year for the next ten years into privately-financed electric utility companies, Donald G. Kennedy, president of Edison Electric Institute, told the American Power Conference held recently at Chicago.

Electric utility financing is increasing faster than gas companies'. This was expressed in a Securities & Exchange Commission release on "New Financing in 1957." Electric utilities are scheduling about $2.7 billion from outside sources, 50% more than last year while gas companies show $1.4 billion, 40% above 1956, the release said.

Future common stock offerings continue at a high level. These will probably be offered in the second quarter: 75,000 shares, Iowa Southern Utilities Co; 220,000 shares, Iowa Electric Light & Power Co; 311,557 shares, United Illuminating Co; $9 million, Interstate Power Co; $12 million, Florida Power Corp, and $21-23 million Virginia Electric & Power Co.

Consumers Power Co common stock offering is 102.6% subscribed for. Stockholders took 95.3% of the 549,324 shares offered on a 1-for-15 basis at $42.75 a share. The employees asked for the balance, necessitating an allotment.

RATES

Jemez Mountain Electric Cooperative, Espanola, N. Mex., reduces its monthly minimum charge to $3 against $3.50 previously. Trustees of the co-op hope it will be possible soon to ask the REA for another rate study with the idea of lowering rates in all classifications.

LEGISLATION

Bill is introduced in the House of Representatives to amend the Federal Power Act to provide that depreciation allowance for electric utilities for rate-making purposes shall be identical with those used by such companies in computing federal income taxes.

Vermont Senate gets bill which would prohibit public utility companies from engaging in the retail sale of appliances and other merchandise.

Michigan's House passes and sends to the Senate a bill to allow public utilities to list charitable contributions as an operating expense when they seek rate adjustments. . . . Massachusetts Senate rejects bill proposing establishment of a State Power Authority.

A bill to permit rural electric cooperatives to serve customers in areas annexed to cities has been introduced in the Texas legislature.

Ohio House gets bill designed to eliminate disruption of public utilities' services. Bill would prohibit lockouts or strikes "which might cause public hardship" in a public utility. Unshackle the wraps now on the State Highway Patrol

from interfering in a labor dispute in the event the dispute involved a utility. Provide up to $1,000 fine and one to three years' imprisonment for damage or destruction to a public utility.

A measure, providing for direct appeal from Indiana PSC rulings to the Indiana Appellate Court, has been passed by the Indiana Senate and sent to the House.

Idaho Gov Robert Smylie signs bill which will prevent either co-ops or private utilities from duplicating services. New law will enforce the "piracy" provision by making it necessary for a change of service, where there is a dispute, to be approved by the District Court of the county. Lines of co-ops and private utilities can be separated by a road's width, but neither can cross into the other's area.

ACQUISITION

American Gas & Electric Co subsidiary takes options on coal lands. Franklin Real Estate Co is planning to acquire about 15,000 acres of coal land in Boyd, Greenup, and Carter counties of eastern Kentucky. It is expecting to start core drilling operations at once to see what the option covers.

Illinois Power Co plans to abandon steam heating service in Danville, Urbana, Champaign, Decatur, and Galesburg.

CONSTRUCTION

Pennsylvania Power & Light Co will spend an estimated $193 million between now and 1961; Oklahoma Gas & Electric Co, $30 million in 1957; Texas Electric Service Co, $25 million in 1957; Houston Lighting & Power Co, a record $69 million in 1957 and about $75 million annually thereafter "for the next several years;" Boston Edison Co, about $38 million in 1957; and Long Island Lighting Co, about $50 million in 1957.

Other companies reporting future construction plans are: Puget Sound Power & Light Co, $90 million for 1956-59 period and Ohio Edison Co, $68.9 million in 1957. . . . Chelan County Public Utility District, Wenatchee, Wash., expects to open bids in June for completion of its 711,550-kw Rocky Reach Dam on the Columbia River, now under preliminary construction.

ADVERTISING

Eye-catchers all: Alabama Power Co runs timely ad under heading, "Avoid disappointment this summer—Do something now about bringing your 'House-power' up-to-date." Message warns to prepare for heavier air conditioning circuits . . . Kansas City Power & Light Co ad discusses "What life would be like without electricity." . . . Philadelphia Electric Co graphically illustrates that the 1936 dollar buys only 65¢ worth of food and clothing—but $1.65 worth of electricity . . . Consolidated Edison Co's columnist, "Uncle Wethbee", comes up with cute story of how vacuum cleaners are used to clean the dinosaur bones at the American Museum of Natural History . . . Public Service Gas & Electric Co's rural paper ads coo, "Nothing beats Reddy Kilowatt as a baby (chick) sitter . . . Under a cartoon of the family queue before the bathroom, there's the caption, "Why wait for hot water? Let hot water wait for you." That's The United Illuminating Co's recent ad entry . . . And in the area development field, The Southern Co starts national series under heading, "Dixie's Accent Sounds Good to Business Ears." . . . West Penn Power Co has after-bath photo of two little girls draped in towels. One is answering a telephone—"Charlie says—'Come as you are'!" and the clincher is that the West Penn Power territory "has everything you need."

"We Salute Our Trailblazers" is an ad being run by Washington Water Power Co to celebrate its 68th anniversary. It shows a photo of each of the 49 employees who have been with the company over 35 years. The ad goes on to say that "one in every four of our present employees has served more than 20 years."

NOW WE INSPECT INSULATORS ALL THE WAY THROUGH

New Ultra-Sonic Method, Related to Radar, Assures Freedom From Previously Hidden Flaws

It's like looking right through the porcelain -- inspection with ultra-sonic vibrations. The smallest hidden flaws reveal themselves to this modern equipment. Critical porcelain sections are given this treatment to assure perfection, inside as well as out.

Very high frequency ultra-sonic vibrations are beamed into the porcelain mass. Their reflections appear as a pulse pattern on the oscilloscope screen. Any internal void or check shows as a characteristic pip. The operator can not only locate but evaluate the condition. He can see through the insulator!

Porcelain lends itself ideally to this internal, nondestructive examination by a modern technique closely related to Radar.

Another step has been taken in the direction of still higher reliability in O-B materials; proof of our intention to make O-B insulators better than ever -- a better buy than ever!

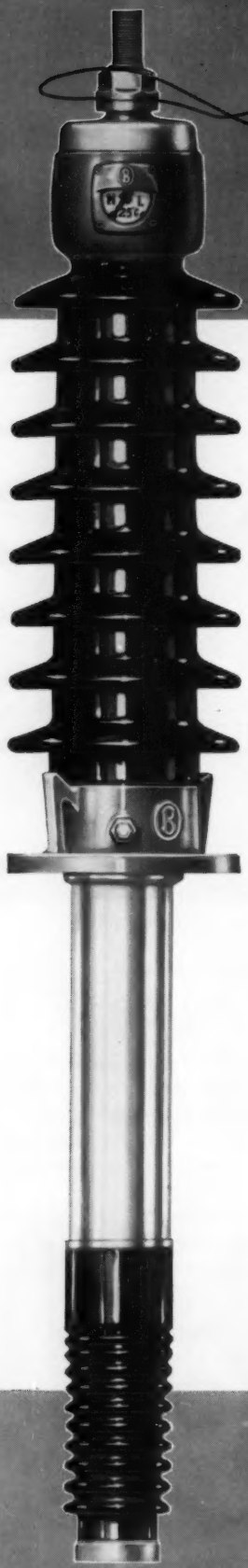
OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

TECHNICAL COMPETENCE

Ohio Brass

4819-H

THE HEART OF EVERY (B) INSULATOR



BUSHING STANDARDS CAN CONSERVE CAPITAL

Purchasing and Management have a special stake in ASA bushing standards. These standards, when in effect, will open new opportunities for conserving invested capital and for control of operating costs.

Formerly, bushings were custom-built, usually for a specific transformer or circuit breaker. Major equipment required service protection in the form of a spare bushing, purchased as part of the new equipment, and retained in inventory. Multiply this by the number of pieces of equipment on a system -- recognizing that bushings are far from cheap -- and you have a sizeable investment.

In many cases, reserve bushings are never used. But, being built for a specific purpose, they become obsolete when their "parent" apparatus is retired. Therefore, after years of eating-up capital, they are finally scrapped at a dead loss.

If this condition were infrequent, or if the dollars involved were few, it would be of little consequence. Unfortunately, quite the opposite has been the case, as your own experience will probably prove better than any argument we can present.

Under the ASA bushing standard, variety will be drastically reduced and the remaining models will be completely interchangeable. Instead of one bushing protecting one piece of equipment, this one can protect many pieces of any given voltage rating, and the total spare bushing investment will shrink drastically.

These spare bushings will be universally applicable regardless of who made either the bushings or the station apparatus. Life of these spares will be indefinite, and their number need not increase, as they will fit both existing and future equipment.

Since standardized bushings are typified by reduced diameters, they will almost always fit the larger clearances of older apparatus. Therefore, their broad protective values will not be delayed until a system is completely modernized.

Presently, the ASA standard is in effect up to voltage ratings of 69 kv. Extension of the standard to all higher voltages is imminent. But, when such standards are fully adopted, it is not necessarily true that all their virtues will be automatic. Standards are not mandatory. They are only a means to an end. This end, in our opinion, is tremendously worthwhile, but it will never be effected without proper support. Such support can come only from individual electric power companies in the form of definite specification of the ASA standard.

Bear in mind, however, that standards control only the physical aspects of a bushing and not in the slightest degree its reliability or performance. These have reached the highest level in our experience of nearly 50 years in the new line of ASA standard bushings produced by the Ohio Brass Company.

OHIO BRASS COMPANY, MANSFIELD, OHIO

4790-I

Ohio Brass

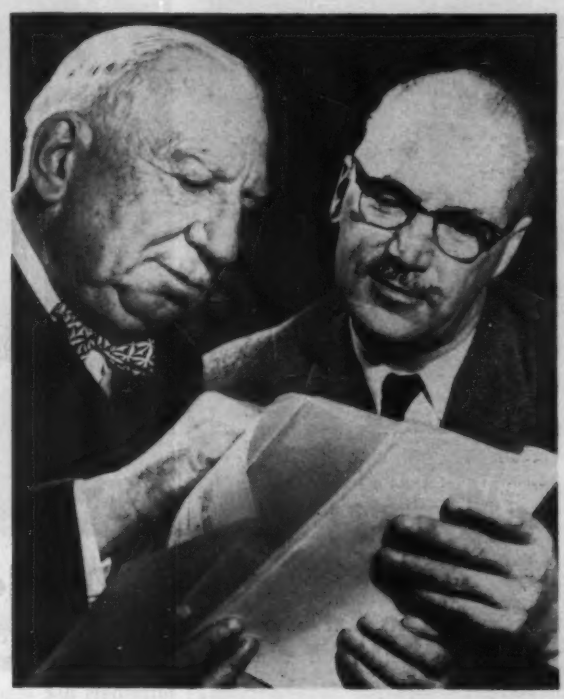
Square D Reports Record Sales; Net Income Tops 1955 by 39%

Sales of the Square D Co last year reached a record of $102,354,200, an increase of 30% over the previous 1955 peak, according to the 1956 annual report released by F. W. Magin (left), chairman, and Gordon Patterson, president.

Net income of the company and its consolidated subsidiaries rose 39% to $11,669,000, equal to $2.28 a share on 5,113,011 shares of common outstanding on December 31, 1956. This compares with $8,386,000 or $1.65 a share on 5,082,936 shares at the end of 1955.

The latter figure is adjusted to reflect a three-for-one stock split on Sept. 14, 1956. According to the report, the split broadened the company's ownership base by 1,000 new shareowners, approximately the number of new jobs created in 1956. At year-end, Square D had 8,400 shareowners and 7,200 employees.

Capital expenditures for new plant and equipment were in excess of $5,000,000 in 1956. A record of $8,000,000 has been budgeted for this year to complete a current expansion program. Previously president of the company, Magin became chairman on Dec. 31, 1956 when Electric Controller & Mfg Co was acquired in a merger. Patterson, formerly president of Electric Controller, become president of the combined companies at that time.



Manufacturers' Earnings

Company	Period Months Ended		Net Income 1956	Net Income 1955	Earnings per Common Share 1956	Earnings per Common Share 1955
Allis-Chalmers Mfg Co..	12	Dec. 31	20,355,045(d)	24,805,326(d)	$2.42	$3.03(d)
Aluminum Co of America	12	Dec. 31	89,621,033	87,600,808	4.24(d)	4.18
Babcock & Wilcox Co...	12	Dec. 31	14,080,981	13,486,717	2.74	2.62
Baldwin-Lima-Hamilton..	12	Dec. 31	3,732,000	1,756,000(c)	0.86	0.40(c)
Foster Wheeler Corp...	12	Dec. 31	1,072,085	1,289,602	1.81	2.19
Cornell-Dubilier Elec....	12	Sept. 30	1,085,047	1,809,002	2.01(b)	3.41
Fairbanks, Morse & Co..	12	Dec. 31	3,858,039	2,707,143	2.81(a)	2.21(a)
Fluor Corp.....	3	Jan. 31	352,400	37,870(l)	0.59(a)	....
General Cable Corp...	12	Dec. 31	12,027,000	6,548,000	5.21	2.73
General Electric Co.....	12	Dec. 31	213,800,000	208,900,000	2.46	2.41
Kennecott Copper.....	12	Dec. 31	143,154,210	125,516,291	13.23	11.60
Minn-Honeywell.....	12	Dec. 31	22,463,657	19,278,648	3.40(a)	2.98(a)
Minnesota Min & Met...	12	Dec. 31	38,437,684	34,323,370	2.30(a'	2.07
Phelps Dodge Corp....	12	Dec. 31	86,976,000	72,319,000	8.58	7.13
Philco Corp.....	12	Dec. 31	339,000	8,423,000	....	2.13
Sylvania Elec Products...	12	Dec. 31	14,835,389	13,812,970	4.10(e)	4.29
Union Carbide & Carbon	12	Dec. 31	146,233,444	145,834,416	4.86	4.86
Wagner Electric Corp...	12	Dec. 31	6,544,757	4,755,079	6.93	5.04
Westinghouse Elec Corp.	12	Dec. 31	3,492,000(f)	42,803,000	0.10(f)	2.46
Worthington Corp.....	12	Dec. 31	9,258,519	7,214,989	6.11	5.21

Notes—(a) Based on shares outstanding at close of period. (b) Based on shares now outstanding. (c) Net incomes and special credit amounted to $3,656,000 or $0.84 per share. (d) Adjusted for two-for-one split in June, 1956. (e) Adjusted to reflect the combination with Argus. (f) After applying LIFO (last in, first out) method of inventory evaluation. Based on stock having a par value of $12.50 per share. (l) Loss.

Westinghouse Reports on Awards, Developments

Two recent turbine orders, a lamp development, a new branch office, and suggestion awards are enumerated by Westinghouse Electric Corp.

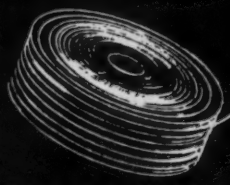
• Awarded a $9.25 million contract for two 170-Mw turbine-generators by Ohio Edison Co. These machines are for the Stratton, Ohio, power plant, were ordered earlier than originally expected because of business growth, and will double the scheduled capacity of the plant that is now under construction. They are scheduled for operation in 1960 and 1961.

• Awarded an order for a 200-Mw turbine-generator by Texas Power & Light Co. This machine is to be installed as No. 2 unit in the Lake Creek Station. Delivery is scheduled for Fall of 1958, and operation is expected by early 1959.

• Developed an Ultralume high-

(*Continued on page* 146)

SPINNING WIRE
FOR EVERYNEED
STEEL
ALUMINUM
STAINLESS STEEL
COPPER
COPPERWELD
TO FIT ANY SPINNER



Please Write For Price & Description

CABLE SPINNING EQUIPMENT CO.
3100 TOPEKA AVE.
TOPEKA KANSAS

Serving the growing Independent Telephone Industry

OVERSEAS SALES:
Ericsson Corp. of New York
Automatic Electric of Canada
Pirelli of Great Britain

GE Develops Underground Capacitors

GE engineers discuss the new metal-enclosed, submersible high voltage capacitor equipment recently developed by the company. The capacitor terminals are made of pipe sections welded to the capacitor can. They are filled with compound and have screw-type caps. Leaded cable is used for connections; it is fitted with wipe joints to line conductors.

Rated at 4,160 v, the units are said to be suitable for installation in log-lined holes, cement vaults, or manholes. The 50-kvar units are designed for primary 5-kv distribution. They measure 34 in. high by 18 in. deep by 54 in. long.

Westinghouse Reports

(Continued from page 145)

intensity fluorescent phosphor by engineers of the Bloomfield, N. J., Lamp Division. This new phosphor is designed to provide greater light output and improved lamp maintenance in fluorescent lamps.

• Opened an air conditioning division branch office at 1903 Ruiz in Houston, Texas, James J. Scanlon is manager. Packaged air conditioners and air-to-air heat pumps will be handled.

• Suggesting a better way to build steam turbines resulted in a total award of $8,960 to Robert Bellar, a welder in the Steam Division, Lester, Pa. This award passed the company mark set only last year. Bellar earned the money for an idea that extension pieces at each steam inlet sleeves could be made integral with the turbine cylinder casting.

• Adopted 7,049 of 25,384 suggestions received, and paid out $209,471 to employees in 1956. A total of 24 awards were $1,000 or more. The highest award—shared by two employees—amounted to $7,786. Since the suggestion program was instituted in 1910 more than $2 million has been paid out in awards.

• Reached an agreement to manufacture a new line of automatic washers, dryers, radio and television sets for Montgomery Ward & Co, according to a report.

(More M&M on page 148)

Standard®

Transformer's DESIGN FEATURES HELP CUT COSTS

● Standard Transformer's attention to transformer components helps cut maintenance costs and boosts transformer life, yet you pay no more for Standard equipment.

Insulation exceeds all ASA specifications and gives increased protection against flashover. Coils are moisture-proof.

Power-sheared laminations minimize short circuits and core loss caused by burrs. Simple construction eliminates expensive and unnecessary clamps and parts in core assemblies. Greater coil surfaces practically double radiated heat.

NEMA size connectors, strain tested by mercurous nitrate, are used on all bushings. Installation and maintenance time and costs are reduced.

Standard engineers will incorporate components of your choosing in your transformers and work with you to design the transformers best suited to your needs.

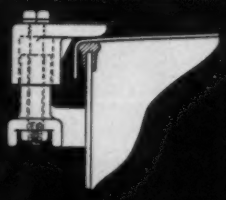
WRITE for your new Standard Single-Phase Transformer Bulletin S-401-B. It's ready now!

Standard®

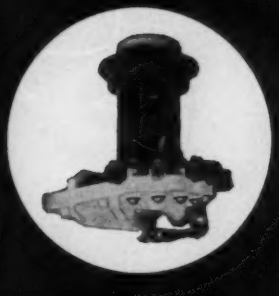
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

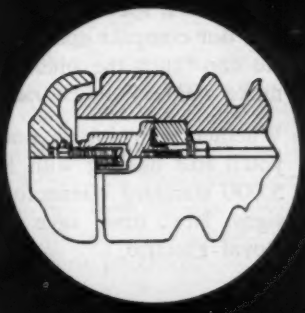
REPRESENTATIVES IN PRINCIPAL CITIES



UNIFORM SEAL—This Standard design feature creates a four-point contact that assures a positive seal completely around the transformer cover. A Neoprene gasket seals out all dust and moisture.



TAP CHANGER—Your transformers can be equipped with four taps above or below, or half above and half below, as you specify. The switch embodies a contact-making assembly with a spring-loaded brass wheel for positive contact. Normal settings are with a four-tap voltage section. 2½% taps within 10% range of normal rating.



TANK WALL BUSHING—Permits line insertion without tools. No exposed live parts. Terminal compression stud keeps insulated plastic cap from falling off when unscrewed to receive primary leads. Cables enter from either side. Pressure from clamping shoe holds lead securely.

"THIS WILL RUIN OUR REPUTATION"

"I GUESS YOU'RE RIGHT. IT'S HARD TO KEEP A THING LIKE THIS QUIET."

You can't expect your wife to stay awake and console you just because production schedules are behind on the new substation. But customers will soon be demanding the power you promised, and excuses won't satisfy them. It isn't your fault that certain components were delivered late, but it *is* your *reputation* that suffers.

Make sure you've got the *most reliable* team of suppliers possible in back of you. When you order switchgear or connectors, specify Royal and be *sure* of delivery. You see, our compact operation is purposely kept flexible, so we can "turn the place upside down", if necessary, to make *delivery when needed.*

Whether your job is normal or rush, large or small, you'll like dealing with Royal—for switchgear, any of 5,000 standard connectors, or specially engineered designs. Next time, save time and trouble—order from Royal Electric.

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

Tear Strip Permits Carton to be Lifted Off Capacitor

Unpacking Line Material Co's capacitor units is as easy as opening a pack of cigarettes. L-M's capacitor cartons now incorporate a tear strip feature.

This feature consists of a reinforced cloth tape cemented around the inside of the carton about 2-in. above the bottom, and attached to pull tabs on the outside of the carton. When a tab is yanked, the tape makes a cut completely around the carton. The corrugated cardboard carton can then be lifted off the capacitor by inserting fingers in a "break-through" on both sides of the carton.

All Elemex 25- and 50-kvar power capacitor units and indoor low-voltage capacitor units are now shipped in the new cartons.

Rubber Output, Use Climb to Record Levels In January

U. S. rubber manufacturing industry reported new records in production and consumption for January. Usage of new rubber exceeded 140,000 long tons for the month while output of all synthetics topped 94,000 long tons.

Of the total new rubber consumed in January, synthetics accounted for 61.87%, slightly above the 61.84 December ratio. Natural rubber usage was 53,410 tons compared to 45,227 tons in December. Reclaimed rubber consumption during January was about 25,200 tons vs 20,728 for the previous month.

Line patrol. The Universal 'Jeep' carries patrol and service crews and equipment along the right of way to structures in off-road locations. It travels in conventional 2-wheel drive at highway speeds, but shifts easily into 4-wheel drive for extra traction to go through mud, soft earth, sand or heavy brush—or climb steep grades—where other vehicles can't go.

How 'Jeep' vehicles cut costs on construction and service jobs

New Forward Control 'Jeep' FC-150. This advanced 4-wheel drive truck puts a 74-inch pickup box on a wheelbase only 81 inches long. With its "go-anywhere" maneuverability, and 200% greater forward visibility, it takes you wherever emergencies threaten service.

Trenching. The 'Jeep'-propelled trencher digs up to 800 feet of clean-cut 6-ft. deep trench per hour, to speed the installation of cable, conduit and service lines. Unit travels at highway speeds between jobs.

From line installation through maintenance and other service activities... the electrical industry is served on job after job 24 hours a day by 4-wheel drive 'Jeep' vehicles.

With the extra traction of their 4-wheel drive, 'Jeep' vehicles take crews and equipment off the road, right to the tower or substation, wherever service is required.

'Jeep' vehicles with power take-off operate a wide range of equipment, including generators... compressors... mowers ...post hole diggers... winches... and many more.

Learn how the electrical industry uses multi-purpose 'Jeep' vehicles for hundreds of different jobs, from installing meters to stringing high lines, and how these vehicles save owners money through long life and low maintenance costs. See your Willys dealer today, or write for information.

The 'Jeep'®

family of 4-wheel drive vehicles

WILLYS... makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

AUSTIN E. PENN

RAYMOND H. ARNDT

ALFRED P. RAMSEY

New Officers Are Elected by Baltimore G&E

In a series of executive appointments, Baltimore Gas & Electric Co has elected J. Theodore Wolfe president; Austin E. Penn, executive vice president; Raymond H. Arndt, vice president; Alfred P. Ramsey, vice president and general counsel; and C. Edwin Bristor, assistant vice president.

Wolfe previously served as executive vice president (See page 67). He succeeds Charles P. Crane, former chairman of the board and president, who has been re-elected chairman of the board.

Penn, who has been associated with Baltimore G&E since 1920, studied law at the University of Maryland and was admitted to the Bar in 1934. He was elected assistant secretary and assistant treasurer in 1939 and became secretary and assistant treasurer in 1946. He has served as vice president from 1950 until his present appointment.

Arndt, a graduate of the University of Illinois, came with Baltimore G&E in 1931 after eight years of experience with the Rockford (Ill.) Gas Light & Coke Co. He was appointed to the post of superintendent of gas manufacturing in 1938 and advanced to assistant general superintendent in 1950. He was named to his most recent position of general superintendent of gas operations in 1951.

Ramsey, who has served as general counsel since 1948, has been with Baltimore G&E since 1924, when he was employed as an attorney. He was elevated to assistant general counsel in 1932. A graduate of Thiel College, Ramsey studied law at the University of Minnesota and Yale University and received his LL.B. degree from Yale University.

Bristor, executive assistant to the president since 1950, is a veteran of 43 years with the company, which he joined shortly after graduation from the Baltimore Polytechnic Institute.

Westinghouse VP's Roseberry

Westinghouse Electric Corp's Carroll V. Roseberry has been elected a vice president and named manager of the midwestern region with headquarters in Chicago. He has been manager of commercial atomic power activities since September, 1955.

In his new post he will be responsible for apparatus activities in all or parts of nine midwestern states. He succeeds A. M. Fisher, who is now district manager of the Minneapolis district.

Roseberry joined Westinghouse 23 years ago shortly after receiving his electrical engineering degree from Oklahoma A & M. He was named a central station salesman in 1936. His 1947 appointment as assistant central station manager for the Pacific Coast district was followed two years later by his promotion to central station supervisor of the Los Angeles area.

In 1951 he was advanced to manager of electric utility sales at Pittsburgh and early in 1955 was named to head the newly formed electric utility and transportation sales department.

CARROLL V. ROSEBERRY

(Continued on page 152)

CAN BE INSTALLED ANYWHERE. Here workers begin to feed RoZone-RoSeal cable into conduit inside underground vault of St. John's Hospital. This versatile cable can be used anywhere—in the air, in conduit and ducts, direct in earth, even in water.

EASY TO PULL. Workers at the new St. John's Hospital in Tulsa draw Rome's easy-pulling high-voltage cable from underground switch vault to surface and power transformers. The hospital's architect recognized *all* the advantages of RoZone-RoSeal (see his letter below).

Profit from this architect's experience with Rome's premium high-voltage cable

LEON B. SENTER, A.I.A.
ARCHITECT
306-7 PHILTOWER BLDG.
TULSA, OKLAHOMA

November 28, 1955

Regarding our choice of RoZone-RoSeal cable for St. John's Hospital:

We can tell you that due to the nature of the building, extreme reliability was the first consideration.

Closely following were the requirements of moisture resistance, inductive capacity in the configuration as laid, and uniformity of product.

We found that a specification built around Rome Cable's RoZone-RoSeal satisfied all the above.

Very truly yours,

LEON B. SENTER, A.I.A.

John C. Penafeather

John C. Penafeather
Mechanical Engineer

JCP:lz

He wanted the same things you probably want in a high-voltage cable: reliability, moisture resistance, the right electrical characteristics, and uniformity. He found them all in Rome Cable's RoZone-RoSeal.

You can use this cable anywhere—in the air, in conduit and ducts, buried in earth, *even in water*. Here's how it compares with most conventional thermosetting nonmetallic cables:

- Costs less.
- Greater resistance to moisture and comparable resistance to abrasion, crushing, impact, chemicals, and oils. oils.
- Easier pulling and bending. The RoSeal (polyethylene) jacket has a lower coefficient of friction than any other jacket material. And it bends easily at temperatures as low as −40° C.
- High corona levels on power cables.

Rome Cable's RoZone-RoSeal met this architect's rigid specifications, and it can meet yours, too.

Specify RoZone-RoSeal for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 702 and ask for Bulletin ROT-1. Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

Hubbard Advances Wennogle

John E. Wennogle, formerly division sales manager for the New York area, has been appointed general sales manager for Hubbard & Co.

Wennogle, who will be headquartered at Pittsburgh, Pa., has been associated with Hubbard since 1934, when he was made district manager in New England. He was advanced to his most recent position in 1954.

In addition to Wennogle's promotion, Hubbard also announced the appointments of three division sales managers and two district sales managers. New division sales managers are Clifford H. Keen, Northeastern Division; Fred T. Campbell, Southeastern; and Frank D. Gibson, Atlantic. Named as district managers were Virgil E. Lown, Salt Lake City; and A. C. Mowery, Portland, Ore.

JOHN E. WENNOGLE

Georgia Power Ups Wade

A. H. WADE, JR

Georgia Power Co has named A. H. Wade, Jr, as assistant to J. F. Pennington, vice president of operations. Wade most recently served as assistant operating manager.

Also promoted were Robert J. Cooper, to assistant operating manager; Charles J. Cregar, to operating engineer; and H. H. Strozier, to assistant chief planning engineer.

Casper Heads New A-C Unit

R. M. Casper is new general manager of Allis-Chalmers Manufacturing Co's recently formed Nuclear Power Division, the fourth component of the Industries Group headed by Vice Pres J. L. Singleton.

Casper, administrative assistant to Singleton since mid-1955, previously held managerial positions in the electrical and power departments.

R. M. CASPER

PERSONAL BRIEFS

George W. Bowen is new underground engineering supervisor for Central Illinois Light Co . . . Savannah Electric & Power Co has promoted **Daryl E. Gaiennie** to assistant superintendent of transmission and distribution.

Shawinigan Water & Power Co's **Leo E. Boissonnault,** assistant vice president of finance, has been appointed treasurer of Quebec Power Co to succeed **N. P. Woods,** retired.

New manager of Oklahoma Gas & Electric Co's Southern Division is **Garland P. Middaugh.** Also appointed were two new district managers, **Norborne C. Auld,** Ada district; and **Phil F. Ruch,** Alva.

Electric Power Board of Chattanooga has elected **Robert H. Dulaney** as secretary and comptroller to assume the post left vacant by the retirement of **Noble J. Simmons.**

At Hydro Electric Power Commission of Ontario, **H. H. Leeming** has been named director of engineering to replace **F. H. Chandler,** who has retired. **W. H. Edwards** becomes director of frequency standardization.

Arthur F. Herwig, executive secretary of Wisconsin Public Utilities Assn for the past 23 years, will retire May 31. His successor is **Dale F. Hansman.**

George W. O'Connor has joined Montana Power Co as executive assistant . . . Recently appointed to the Washington State Public Service Commission was **Francis Pearson.**

West Penn Power Co has made the following appointments: **Doyle V. Shaeffer,** district manager at Kittanning to succeed retiring **A. B. Eadie; Lester V. Smith,** district manager at Vandergrift; **William J. Minor, Jr,** Vandergrift district engineer; **Arthur L. Baily,** New Kensington district engineer; **Richard A. Egli,** Armstrong station superintendent; and **Darl E. Kordes,** Milesburg station superintendent.

Kansas Power & Light Co's **Harry Koblitz** has been named Leavenworth plant superintendent . . . **Allen E. Kintigh** has been advanced to operating superintendent of New York State Electric & Gas Co's Brewster district. He will be succeeded as resident engineer, Auburn district, by **Robert S. Johnson.**

(More Personal Briefs on page 155)

RELENTLESS VIBRATION

Another reason why Automatic Switch chooses K&M MOUNTING PANELS

The photo above, typifying severe vibration, indicates why Automatic Switch Co., Orange, N. J., uses K&M Ebonized Asbestos mounting panels for this automatic transfer switch. Its strength and stubborn resistance to shattering make it ideal for almost all panel-mounting requirements.

K&M Ebonized Asbestos is made of tough mineral asbestos fiber and binding cement, molded under pressure and then impregnated with insulating compound. The resulting panel material is light in weight, uniformly dependable, easy to work, economical.

You need K&M Ebonized Asbestos if you manufacture or use switchboard mountings, bus bar runs switchgear compartment linings, test tables, bench boards, or other equipment. It comes in sheets 42″ x 96″ and 48″ x 96″, ⅛″ to 4″ thick . . . also in special sizes and with beveled edges. Write us for complete details.

K·M
BEST IN ASBESTOS

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA
In Canada:
Montreal, Toronto, Winnipeg, Vancouver and Edmonton

INDIANA STEEL & WIRE CO
Crapo
Galvanizing
MUNCIE IND
Signs along the lines of
Crapo GALVANIZED STEEL STRAND PERFORMANCE
For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.
The famous Crapo galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.
• Low maintenance cost
• Laboratory tested and controlled quality
• Meets highest quality standards
• A size and grade for all practical needs
• Contact your Crapo Jobber Today!
INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

Men on the Move

Now available in a *new edition* . . . with *new figures.*

This popular booklet points up the important sales problem of personnel turnover in industry. Out of every 1,000 key men (over a 12-month period) 343 new faces appear . . . 65 change titles . . . 157 shift . . . and 435 stay put. These figures are based on average mailing address changes on a list of over a million paid subscribers to McGraw-Hill magazines.

Write us for a free copy

Company Promotion Department

McGraw-Hill Publishing Co., Inc.
330 West 42nd Street,
New York 36, New York

Washington's Legislature Likes Plant, but Not SPC

Plans for construction of a steam power plant are finding favor with the same Washington state legislature which may end the life of the public agency most actively promoting the plant.

The House of Representatives has approved, without a single dissenting vote, a measure which would appropriate $275,000 for a continuing study of the plant, including the preparation of plans. The Senate Public Utilities committee meanwhile gave "do pass" recommendations to bills which would abolish the State Power Commission, strongest advocate of the plant, and transfer its functions to the State Department of Conservation and Development.

If the commission is abolished, the $275,000 appropriation would go to the agency assuming its functions, or to a joint operating agency of the PUDs.

The commission, established in 1953, lost much public power support when it contested the right of the Grant County PUD to build Priest Rapids Dam on the Columbia River. Its foes contend that its elmination would save the state more than $100,000 during the next two years. The commission has conducted studies on construction of a steam power plant in the Roslyn-Cle Elum coal mining area.

Portland GE Chooses Gas

Portland General Electric Co will use natural gas for fuel for two boilers in its station L steam standby plant close to downtown Portland this summer. The utility and the Portland Gas & Coke Co jointly announced signing of a contract for supply of up to 30,000 therms daily of natural gas to the mid-city plant on an interruptible basis this summer. It is believed the first use of natural gas in electric generation in this area.

WONDERFUL LIFE *by Bud Adams*

The only difference between hydroelectric engineers and small boys is one of scope—and imagination equalizes that.

Personal Briefs

(*Continued from page* 152)

Central Illinois Public Service Co's **Harland G. Grim** has been advanced to Southern Division substation engineer. He succeeds **Harry C. Wilson,** who now heads the new communication-telemetering section at Springfield. **Herman J. Talken** has advanced to electric meter engineer in CIPSCO's operating department.

John J. Antonini has been designated community representative in West Penn Power Co's Keystone Division and **William H. Roll** has assumed the newly created post of supervisor of residential and farm lighting at the general office.

Edward Gerstenschlager has been appointed manager of production engineering of Babcock & Wilcos Co's Boiler Division . . . B&W's Tubular Products Division has as its new assistant chief electrical engineer **Michael Parahus, Jr.**

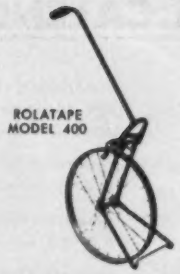
Edward H. Petrick has joined Brown Co as vice president in charge of sales and will direct sales of the firm's pulp, paper, and chemical products. **Arthur Taylor** remains in direct charge of the Bermico Division.

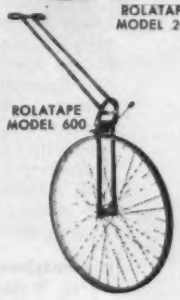
New president of the Nuclear Energy Products Division of ACF Industries, Inc, is **Dr Marshall G. Holloway** . . . Atomics International, a division of North American Aviation, Inc, has named **Robert R. Sehnert** eastern representative.

Charles E. Bryan has joined Reynolds Metals Co as assistant product supervisor for electrical conductors . . . Recently named manager of Kaiser Steel Corp's commercial research department was **Wilfred R. Riggs, Jr.**

Nordberg Manufacturing Co's **Carl O. Friend** has been designated director of the Power Equipment Division of the U. S. Department of Commerce's Business and Defense Services Administration for a six-month term.

Anaconda Wire & Cable Co has designated **P. Howard Farley** as manager of contractor sales.





ROLATAPE is the Fast, Efficient, Economical, Modern way to measure. Model #400 is widely used by Road Construction Companies, Telephone Companies, Utilities, Sewage Departments and many other industries where measurements are important.

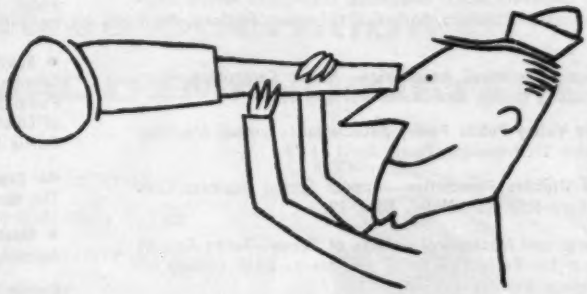
MEASURING time is cut to a fraction with Rolatape. Model #200 is extremely popular with Real Estate Men, Appraisers, Traffic Officers and many others who demand fast, accurate, measurements.

WHEELS on all Rolatapes are precision calibrated, and can be depended upon for long-life service. Model #600 is a special model for long-distance, acreage measuring and for use over rougher terrain.

FOR FAST, ACCURATE measuring—Rolatape Measuring Wheels are the answer. Models #400 and 600 measure distances up to nearly nineteen miles.

MEASURING is simple, time-saving, and efficient when you use a Rolatape. FOR COMPLETE DETAILED ROLATAPE INFORMATION, SEE YOUR DEALER, DISTRIBUTOR, OR WRITE TO:

ROLATAPE, INC.
Factory: 1741 Fourteenth Street, Santa Monica, California



You're on target...in Electrical World

if you want to reach anyone concerned with the large-scale generation, transmission, distribution or utilization of electricity . . . because that's the length, breadth and height of ELECTRICAL WORLD's audience of 26,000 *all-paid* subscribers . . . in the utilities and big industry, among electrical manufacturers and consultants. No other magazine covers the *entire* Electric Power Industry, no other magazine commands the loyal attention of the industry. For further fast, factfull information, write for "Quick Facts" . . . Electrical World, 330 West 42nd St., New York 36, N. Y.

MEETINGS CALENDAR

APRIL

Edison Electric Institute—Accounting Division Advisory and Executive Committee, Madison Suite, Sheraton Park Hotel, Wash., D. C., April 8; National Accounting Conference of Electric & Gas Utility Accountants, held jointly with AGA, Washington, D. C., April 8-10; Industrial Relations Committee, jointly with Personnel Sections of Indiana Electric Assn. and Ohio Electric Utility Institute, and Personnel Practices Committee of Pennsylvania Electric Assn., Netherland Plaza Hotel, Cincinnati, Ohio, April 18-19; Meter and Service Committee, Soreno Hotel, St. Petersburg, Fla., April 24-26; Purchasing and Stores Committee Executive Committee and 10th Annual Meeting, Penn Sheraton Hotel, Pittsburgh, Pa., April 28-May 1; Insurance Committee, Williamsburg Inn, Williamsburg, Va., April 29-30; Accident Prevention Committee, Algiers Hotel, Miami Beach, Fla., April 29-May 1.

American Society of Mechanical Engineers—Spring Meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala., April 8-10.

Northeast Missouri Electric Power Cooperative—Eighth Annual REA Electric Generating Plant Operation and Maintenance Conference, Phillips Hotel, Kansas City, Mo., April 8-11.

National Electrical Industries Show—Fourth National Electrical Industries Show, 71st Regiment Armory, Park Ave. and 34th St., New York City, April 8-11.

Public Utilities Association of the Virginias—Rural Committee, Jackson's Mill, W. Va., April 9; Executive Committee, Richmond, Va., April 12.

Institute of Radio Engineers—First Annual Conference on Electronics in Industry, Illinois Institute of Technology, Chicago, Ill., April 9-10.

American Welding Society—Fifth Welding Show, Convention Hall, Philadelphia, Pa., April 9-11.

Electrical Engineers (ASEE) Exhibition, Ltd—Sixth Annual Electrical Engineers Exhibition, Earls Court, London, England, April 9-13.

Pennsylvania Electrical Association—Meter Committee, Garden City, Long Island, New York, April 11-12.

Tennessee Valley Public Power Association—Annual Meeting, Road House, Chattanooga, Tenn., April 11-12.

Maryland Utilities Association—Annual Spring Business Conference, Lord Baltimore Hotel, April 12.

Agricultural and Mechanical College of Texas—Tenth Annual Conference for Protective Relay Engineers, A&M College of Texas, College Station, Tex., April 15-17.

American Institute of Electrical Engineers—Great Lakes District Meeting, Hotel Fort Des Moines, Des Moines, Iowa, April 15-17; Third Biennial Conference on Electric Heating, sponsored jointly by AIEE and the Toledo section of AIEE, Commodore Perry Hotel, Toledo, Ohio, April 23-24.

Rocky Mountain Electrical League—Spring Conference, Shirley-Savoy Hotel, Denver, Colo., April 21-24.

Northwest Public Power Association—Engineering and Operations Section, Tacoma Utility Center and Winthrop Hotel, Tacoma, Wash., April 23-24.

Lead Industries Association—Annual Meeting, sponsored jointly with the American Zinc Institute, Drake Hotel, Chicago, Ill., April 24-25.

National Industrial Research Conference—Sponsored by Armour Research Foundation of Illinois Institute of Technology, Conrad Hilton Hotel, Chicago, Ill., April 24-25.

Pacific Coast Electrical Association—Administrative Services Section, Hotel La Playa, Carmel, Calif., April 24-25.

Association of Edison Illuminating Companies and Edison Electric Institute—Meter and Service Committee, Soreno Hotel, St. Petersburg, Fla., April 24-26.

Northwest Electric Light & Power Association—Engineering and Operating Section, Sun Valley, Idaho, April 24-26.

American Power Dispatchers Association, Inc—National Spring Meeting, Los Angeles, Calif., April 26-27.

Institute of Radio Engineers—Eleventh Annual Technical Conference on Television, Cincinnati Engineering Society Bldg., Cincinnati, Ohio, April 26-27.

MAY

American Institute of Electrical Engineers—Northeastern District Meeting, Wendell-Sherwood Hotel, Pittsfield, Mass., May 1-3.

Edison Electric Institute—Transmission and Distribution Committee, Muehlebach Hotel, Kansas City, Mo., May 2-3; Prime Movers Committee, Tides Hotel, St. Petersburg, Fla., May 6-8; Hydraulic Power Committee, Highland Hotel, Massena, New York, May 13-15; Industrial Relations Committee, EEI Headquarters, New York City, May 16; Electrical System and Equipment Committee, Statler Hotel, Buffalo, N. Y., May 20-21; Accounting Division Time and Place Committee jointly with AGA, AGA Headquarters, New York City, May 23; Financing and Investor Relations Committee, Edgewater Beach Hotel, Chicago, Ill., May 31-June 1.

• **Pennsylvania Electric Association**—Hydraulic Power Committee, Skytop Lodge, Skytop, Pa., May 2-3; Communications Committee, Hotel St. Francis, Canton, Ohio, May 6-7; Eighth Annual Customer Relations Conference, Hotel Hershey, Hershey, Pa., May 8; Electrical Equipment Committee, Hotel Roosevelt, Pittsburgh, Pa., May 9-10; Relay Committee, Bedford Springs Hotel, Bedford Springs, Pa., May 16-17; Systems Operation Committee, Skytop Lodge, Skytop, Pa., May 23-24.

• **Southeastern Electric Exchange**—Engineering & Operations Sections, Fontainbleau Hotel, Miami Beach, May 2-3; Heat Pump Steering Committee, sponsored jointly with Association of Edison Illuminating Companies and Edison Electric Institute, Battle House, Mobile, Ala., May 10-11.

Air Conditioning and Refrigeration Institute—Annual Meeting, The Homestead, Hot Springs, Va., May 5-8.

• **Electric Companies Advertising Program** — Copy Group Meeting, Hotel Statler, Cleveland, Ohio, May 8.

Public Utilities Advertising Association—Annual Convention, Hotel Statler, Cleveland, Ohio, May 8-10.

Industrial Nuclear Technology Conference—Museum of Science and Industry, Chicago, Ill., May 14-16.

Pacific Coast Electrical Association—Annual Convention, Fairmont Hotel, San Francisco, Calif., May 15-17.

American Institute of Mining, Metallurgical and Petroleum Engineers—Eleventh Annual New England Regional Conference, Hotel Statler, Boston, Mass., May 17-18.

• **National Association of Electrical Distributors**—49th Annual Convention, Sheraton Park and Shoreham Hotels, Washington, D. C., May 26-29.

• Additions this week.

Edison Electric Institute

Annual Convention will be held in the Palmer House, Chicago, Ill., on June 3-5.

Report on DEMAND METERING:

Lincoln J2T Singlephase Thermal-Demand Watthour Meter.

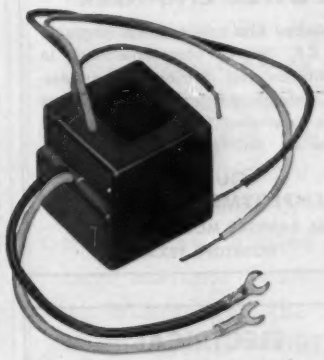
10 YEAR SERVICE RECORD PROVES 99.7% troublefree operation of LINCOLN THERMAL DEMAND METERS

A large southwestern utility operating over a wide territory, under adverse operating conditions, reports that only 0.3% of all Lincoln JT and J2T thermal-demand meters have given any kind of trouble over a ten year period of time.

This company has more than ten thousand of these Lincoln singlephase thermal-demand watthour meters now in service.

The J2T is ideally suited for application to singlephase residential and commercial loads. It is supplied with scale values of 12 KW, 24 KW, and 48 KW to take full advantage of the capacity of J2 Watthour Meters. It is also available with dual range scales for growing loads.

You, too, can cut demand measurement costs—eliminate maintenance troubles, by using Lincoln J2T Meters. If you would like to know more about the J2T, write us today.



Encapsulated coil assures maximum protection from lightning and high voltage surges.

The potential transformer coil of the demand element is encapsulated in a specially developed epoxy resin with extremely high dielectric strength. Thus, the insulation levels of the demand element and the watthour meter element in these combination meters are equally high.

SM57-1

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

PROFESSIONAL SERVICES

BLACK & VEATCH
Consulting Engineers
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

ELECTRICAL TESTING LABORATORIES, INC.
Electrical, mechanical, photometric, radiometric and chemical laboratories, rendering testing, research and associated services, including certification. Inspections at factories and field investigations.
2 East End Avenue at 79th St., New York 21, N. Y.

M. W. KELLOGG
Piping System Flexibility Analyses
Unique model tester as well as modern digital computer facilities available for low cost, accurate flexibility analyses of the most complex piping systems.
The M. W. Kellogg Company
711 Third Ave., New York 17, N. Y.

THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood
Transmission Lines
Distribution & Maintenance
175 Endfield St. Hartford, Conn.

ROBERT E. FOLEY CONSTRUCTION CORPORATION
Construction & Maintenance
Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers
48 Griswold St. Binghamton, N. Y

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design
Engineers . . Purchasing
Specialists in Financing
Accounting and other Operations
231 So. La Salle St. Chicago 4

COMMONWEALTH SERVICES INC.
Management and
Business Consultants
300 Park Ave.
New York 22, N. Y.

ASSOCIATES INC.
Consulting and Design
Engineers
209 E. Washington
Jackson, Michigan

HOOSIER ENGINEERING COMPANY
Erection and Maintenance of Electrical Transmission and Distribution Lines
1384 Holly Avenue, Columbus, Ohio

SARGENT & LUNDY
Engineers
140 South Dearborn St.
Chicago, Ill.

DAY & ZIMMERMANN, INC.
Engineers & Constructors
Transmission & Distribution Lines
Substations
Design & Construction
Reports - Valuations - Rates
Industrial & Utility
New York PHILADELPHIA Chicago

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Investigations—Depreciation Studies—Cost Trends—Reports
for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Original Cost and Continuing Property Record Determination
Ann Arbor, Michigan

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1333 North Second Street Abilene, Texas

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

POWER ENGINEER

Established firm needs power engineer with E.E. Degree plus experience in transmission and distribution engineering. Outstanding potential for ambitious person interested in his development. Age to 45. Salary in $12,000 bracket.

QUINBY EMPLOYMENT SERVICE
406 BANKERS MORTGAGE BLDG.
HOUSTON, TEXAS

ELECTRICAL DESIGNERS

Conduit and physical layout men. Control and wiring exp. desirable but not necessary. Work in air conditioned offices of a leading hydroelectric consultant in Chicago. Good starting salaries and liberal fringe benefits. Challenging work and opportunity for advancement. Please send complete resume to Hugo Niemi, Personnel Manager

HARZA ENGINEERING CO.
400 West Madison Street Chicago 6, Ill.

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Electrical Designers—Top Salary, Scheduled Overtime at Time & One-Half Rates. Immediate Openings. Permanent Positions, Paid Holidays & Vacations. Experience required in Power Plants & Industrial Building, Marbarry Corp., 120 Greenwich St., N. Y. 6, N. Y. REctor 2-3749.

Electric Distribution Engineer with minimum ten years utility distribution experience. Consulting staff position one year foreign service. Distribution economics, design, standards, and operation improvement large power system undergoing modernization. Excellent living conditions, substantial salary and living allowance, wife accompany. Age 34 to 68. P-4796, Electrical World.

POSITION WANTED

Chief Engineer and/or Maintenance Foreman in steam power plant. Age 42, married, no children. Seven years operating experience (18 months in Peru) and 6 years in mechanical maintenance. Desire Latin American Position. PW-4792, Electrical World.

ELECTRICAL ENGINEER

Graduate electrical engineer with patent law experience to understudy company patent attorney. Position offers excellent opportunity for advancement. All communications will be held in confidence. Location Cleveland, Ohio. Send resume and salary requirements to
P-4603, Electrical World,
520 N. Michigan Ave., Chicago 11, Ill.

SUBSTATION EQUIPMENT
TRANSFORMERS
3 50 KVA G. E. 22,000—2300 V.
3 1667 KVA G. E. 13,800—600 V.
3 50 KVA West. 13,800—125/250 V.
SYNCHRONOUS CONDENSER
20,000 KVA, Whse., 13,800 V., 3 Ph., 60 Cy., 720 RPM MODERN UNIT
BREW, WOLTMAN & CO., INC.
52 Church St., New York 7, N. Y.

MOTORS—GENERATORS
TRANSFORMERS
NEW—REBUILT
World's Largest Inventory
ELECTRIC EQUIPMENT CO.
Phone Station Collect GL 3-6783
P. O. Box 51, Rochester, N. Y.

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
EBASCO SERVICES INCORPORATED
APPARATUS EXCHANGE Two Rector St., New York 6, N. Y.

Advertising in This Issue

Allis-Chalmers Mfg. Co....4th Cover
8, 9, 38, 39
Anaconda Wire & Cable Co....52, 53

Barkelew Electric Mfg. Co..... 132
Brown Boveri Corp. 28
Brown Company..... 134
Buffalo Forge Co.....34, 35

Cable Spinning Equipment Co.... 146
Cavalier Corp..... 47
Chapman Chemical Co..... 29
Chase Brass & Copper Co..... 32
Cope Inc., T. J..... 130
Copperweld Steel Co..... 14

Delta-Star Electric Division, H. K. Porter Company, Inc..... 123
Directory of Engineers..... 158
Dow Corning Corp..... 135
du Pont de Nemours & Co., (Inc.) Polychemicals Dept..... 131

Electro-Motive Div., General Motors 16, 17
Engineers, Directory of..... 158
Enjay Company, Inc..... 125

Fisher-Pierce Co., Inc..... 54

G & W Electric Specialty Co.... 129
General Electric Co.
Apparatus Dept.....2nd Cover
91, 92, 93, 120
Graybar Electric Co., Inc..... 7
Grinnell Co., Inc..... 27

Hotpoint Co..... 50

I-T-E Circuit Breaker Co.
R&IE Equipment Div..... 36
Switchgear Div..... 46
Indiana Steel & Wire Co., Inc.... 154

Kaiser Aluminum & Chemical Sales, Inc....95, 96, 97, 99, 100, 101
103, 104, 105, 107, 109
Kearney Corp., James R..... 51
Keasbey & Mattison Co..... 153
Kuhlman Electric Co..... 57

Lapp Insulator Co., Inc.....10, 11
Line Material Co.....23, 24, 25, 26

McCabe-Powers Auto Body Co... 15
Minneapolis-Honeywell Regulator Co. Industrial Div..... 58
Moloney Electric Co.....3rd Cover
Monsanto Chemical Co..... 42
Motorola Communications & Electronics, Inc. 6

Ohio Brass Co.....59, 60, 61, 62
143, 144
Okonite Co., The..... 4

Paranite Wire & Cable Div. Essex Wire Corp..... 138
Pennsylvania Transformer Co.... 33
Pioneer Service & Engineering Co. 126
Porcelain Products, Inc..... 45
Preformed Line Products Co..... 48
Premax Products Div. Chisholm-Ryder Co., Inc..... 132
Pritchard & Co. of Cal..... 128

RT&E Corp. 127
Radio Corp. of America.....30, 31
Reliable Electric Co..... 37
Rockbestos Products Corp..... 160
Roebling's Sons Corp., John A... 121
Rolatape, Inc. 155
Rome Cable Corp..... 151
Royal Electric Mfg. Co., Inc..... 148

S&C Electric Co..... 18
Sangamo Electric Co..... 157
Searchlight Section 158
Socony Mobil Oil Co., Inc..... 43
Southern States Equipment Corp. 55
Southwire Co. 56
Standard Transformer Co..... 147
Subox Inc. 122

Tel-E-Lect Products, Inc..... 124

United States Rubber Co..... 44

Victor Insulators Div.
I-T-E Circuit Breaker Co..... 133

Wagner Electric Corp..... 49
Westinghouse Electric Corp....12, 13
41, 111, 112, 113, 114, 115, 116
118, 136, 137
Wheeler Mfg. Co., C. H..... 40
Willys Motors Inc..... 149

■

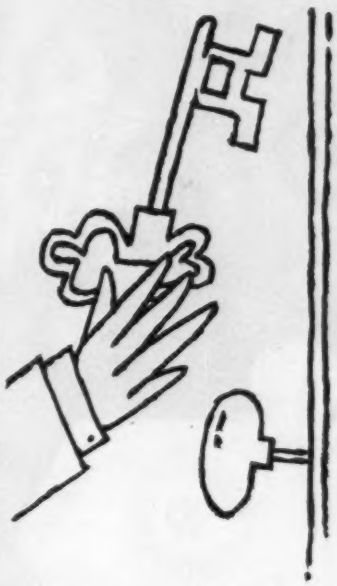
PROFESSIONAL SERVICES..... 158

■

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES..... 158

EQUIPMENT
(Used or Surplus New)
For Sale..... 158



You've got the key in your hand . . .

the key that unlocks the tremendous market potential of the Electric Power Industry . . . whoever you want to reach, no matter which segment of this complex, expanding market they're in. ELECTRICAL WORLD's audience of more than 26,000 *all-paid* subscribers is the bone and marrow of the entire industry—the key people wherever electricity is generated, transmitted, distributed or utilized in large amounts. Want the whole story . . . the real significance of WORLD's audience to you? Simple. Write today for "Quick Facts". . .

ELECTRICAL WORLD
330 W. 42nd St.,
New York 36, N. Y.

Do you worry about power distribution problems

AT 3:00 A. M.?

If you have a power distribution system problem — either in an old building or in that new one you're planning — here's one way you can stop losing sleep over it. Just use Rockbestos A.V.C. (asbestos, varnished-cambric insulated) Interlocked Armored Cable. It will help you cut costs and at the same time assure you dependable service. Here's why:

- Rockbestos A.V.C. Interlocked Armored Cable gives you more current capacity than cable in conduit or other armored cable. Single conductors are standard N.E.C. Type AVA power cables.
- You save important dollars by eliminating the need for costly conduit or ducts.
- It's easily installed on racks or hangers beneath the ceiling or next to walls.
- It can be installed up, down or around walls, beams or posts.
- It cuts installation time and permits quick, easy repairs.

Get all the details on Rockbestos A.V.C. Interlocked Armored Cable — Write now for catalog which gives complete specifications and application data.

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT | NEW YORK, CLEVELAND, DETROIT, CHICAGO, PITTSBURGH, ST. LOUIS, LOS ANGELES, NEW ORLEANS, OAKLAND, SEATTLE

ROCKBESTOS

A. V. C. Interlocked Armored Cable

For New Buildings, Expanding Existing Circuits, Relocating Old Circuits

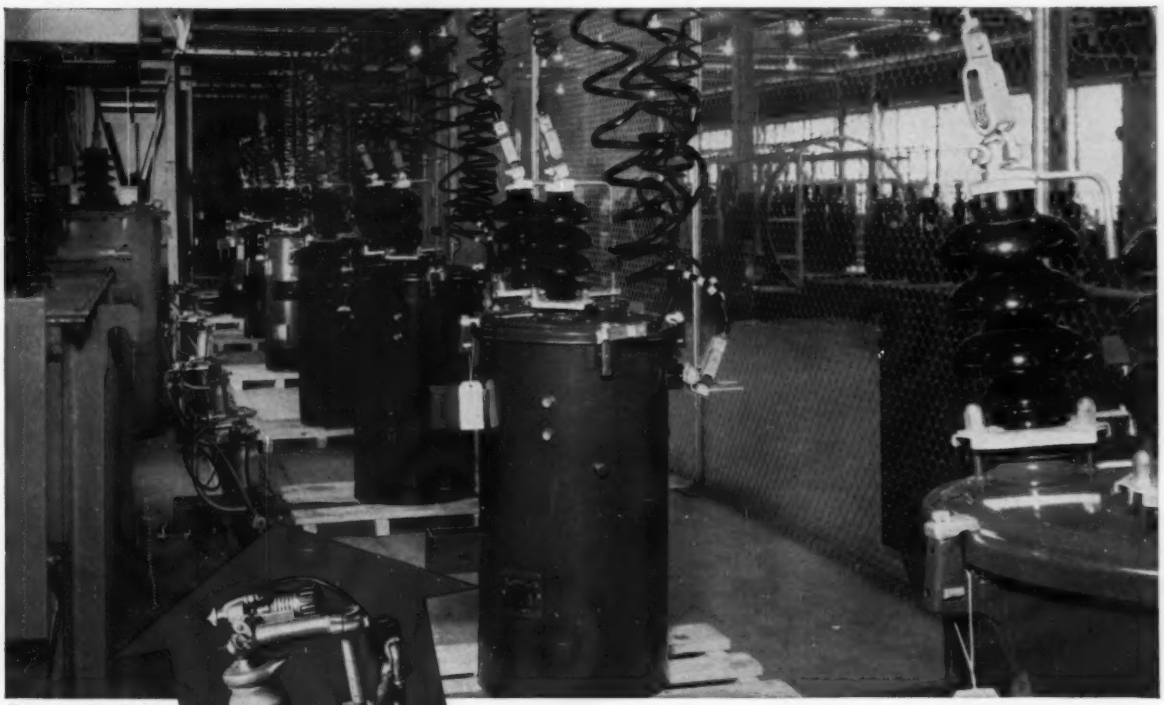
AT MOLONEY . . .
WE DON'T LIKE POLKA DOTS

And here's why . . .

Moloney's new automatic test system records each transformer's case history as it goes through the line. Occasionally, in spite of us, one 'flubs its dub'. When this happens a small jet automatically sprays a spot of color, which looks somewhat like a polka dot on the transformer tank.

This procedure insures against crating and shipment of a substandard transformer, but it also means that the transformer in question gets sent to our research and development laboratory. Once there, we want to know why, and won't stop until we *do know*. Analysis of the findings concerning these occasional failures does much to minimize the possibility of recurrence. At the same time our automatic test facilities assure the utility that only transformers capable of top performance are shipped.

M697-S



Patent Applied For

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers
Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit
Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway
Transformers • Industrial Dry Type Transformers Transformers and Inductors for Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

No Storage Problem Here!

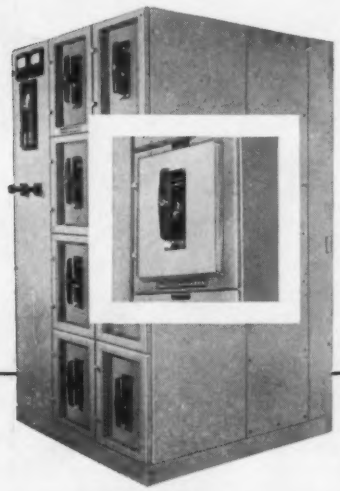
Only Allis-Chalmers low voltage switchgear permits convenient storing of breaker in its own compartment with door closed!

To give space needed when breaker is in disconnected position, center panel is reversed by simply loosening four knurled nuts. No tools are needed.

A specially contoured reversible center panel in each compartment door does the trick. When breaker is in test or completely disconnected position, the center panel may be reversed to extend outward from the surface of the unit . . . gives additional space inside cubicle.

This means no special storage space is required for breakers not in use. Handling and danger of damage during movement of breakers are eliminated.

As long as breaker is in compartment it is always firmly fastened to withdrawal mechanism and can't make contact accidentally.



Get the complete story!

There are many other desirable features in Allis-Chalmers low voltage switchgear. For details call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-5169